

**BEFORE THE ADMINISTRATOR,  
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**

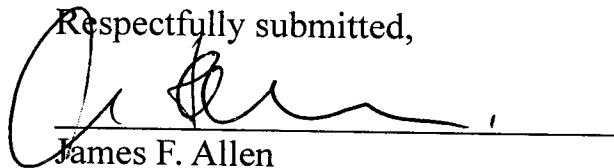
**In Re: THE FERROALLOYS ASSOCIATION  
900 2nd Street, Northeast, Suite 201  
Washington, D.C. 20002,**

**on behalf of its members,  
Bear Metallurgical Company  
CS Metals of Louisiana  
Gulf Chemical & Metallurgical  
Corporation  
Shieldalloy Metallurgical Corporation  
Strategic Minerals Corporation**

**SUPPLEMENT TO PETITION  
FOR RULEMAKING**

On August 1, 2001, the Ferroalloys Association ("TFA") filed a Petition for Rulemaking (the "Petition") to amend the land disposal restrictions ("LDR") for spent hydrotreating and hydrorefining catalysts, waste codes K171 and K172. Since that time, TFA has acquired certain additional data and information relevant to the Petition. As a result, TFA is filing the attached Supplement to the Petition, and requests that it be incorporated into and considered with the Petition.

Respectfully submitted,



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Association

Dated: April 3, 2002

## SUPPLEMENT TO PETITION FOR RULEMAKING

### Introduction

TFA petitioned EPA to revise the LDR applicable to spent hydrotreating and hydrorefining catalysts, K171 and K172. TFA demonstrated that the existing LDR are in several respects inadequate to minimize short and long term threats to human health. This petition is pending before EPA. *See* Petition for Rulemaking, *filed by* The Ferroalloys Association (August 1, 2001) (referred to hereafter as the “Petition”).

Since filing the Petition, three things have occurred:

- (1) TFA members have acquired new data that further support the argument that the existing LDR allow inadequately treated catalyst to be landfilled, and must be revised.
- (2) TFA discovered that at least one refinery is considering management of spent hydrotreating/hydrorefining catalyst as an “oil-bearing residual,” under the exemption from “solid waste” contained in 40 CFR § 261.4(a)(12). This “non-waste” would be processed through a thermal desorber and disposed of as “F037,” the generic listing for the residue from treating oil-bearing residuals.

TFA found that EPA did not consider the unique properties of spent catalyst when it (1) listed F037, and (2) adopted LDR for F037. TFA pointed out this deficiency with the F037 LDR in the Petition; however, in light of the actual use of the “oil-bearing residual” exemption, and the seriousness of the oversight, TFA wishes to expand upon and reemphasize this deficiency.

To make matters worse, TFA has also learned that the same refinery has submitted a petition to the Louisiana Department of Environmental Quality seeking to “delist” the F037 residue, including F037 generated from spent catalyst. Unless the LDR are corrected to reflect the unique risks presented by residue from processing spent catalyst, state agencies will have inadequate regulations and guidance to review delisting petitions. This could result in certain waste being delisted which does not meet proper criteria.

- (3) EPA has proposed a new policy which sets resource recovery as “Goal No. 1” for future management of solid waste. This policy gives added momentum to EPA’s oft-stated preference for recycling and reuse of materials over land-disposal.

### **Spent Catalyst with toxic PAH above the UTS is still being landfilled**

The purpose of LDR is to prevent land disposal of inadequately treated hazardous waste. In its Petition TFA demonstrated that because of the deficiencies in the LDR, spent hydroprocessing catalyst with polyaromatic hydrocarbons (“PAH”) higher than the universal treatment standards (“UTS”) is being buried in landfills. Petition at 12-16.

TFA members have received information which confirms that this practice is still going on. The following data was reported for spent catalyst from a Texas refinery. *See* Exhibit A. This material was classified “K172,” and sent directly to a landfill in Texas without treatment for organics.

Parameter	Concentration	Reference Value
Total antimony	159 mg/kg	
Total cobalt	1210 mg/kg	
Total molybdenum	12,700 mg/kg	
Total nickel	15,800 mg/kg	
Total vanadium	31,500 mg/kg	
TCLP nickel	31 mg/l	11 mg/l (LDR)
TCLP vanadium	24 mg/l	1.6 mg/l (LDR)

Chrysene	13 mg/kg (J)	3.4 mg/kg (UTS)
Naphthalene	ND(<26 mg/kg)	5.6 mg/kg (UTS)
Phenanthrene	150 mg/kg	5.6 mg/kg (UTS)
Pyrene	38 mg/kg	8.2 mg/kg (UTS)

Note: J=estimated value between MDL and PQL.

As indicated in the Petition, the designation “K172” (which has no LDR for PAH) allows landfilling of spent catalyst with PAH levels substantially higher than the UTS for those compounds. Petition at 12-16. This new data confirms that the LDR for K172 are inadequate to prevent toxic levels of PAH from land disposal.

The laboratory detection limits for PAH are at 26 mg/kg for most parameters because the samples need to be diluted by a factor of 80 due to interferences in the test. This data support TFA’s position that the oily nature of the catalyst causes interferences and high detection limits in the PAH analysis. The best example is the naphthalene result, which is reported as “ND” (not detected), but the detection limit is 26 mg/kg, which is much higher than the UTS of 5.6 mg/kg. Accordingly, no one knows whether or not catalyst with naphthalene higher than the UTS was landfilled.

This additional data is further proof that the existing LDR do not prevent landfilling of spent hydroprocessing catalyst containing levels of PAH above those considered safe.

**Neither the expanded listing of F037 nor the LDR for F037 take into account the unique hazardous properties of spent catalyst.**

On November 2, 1990, EPA adopted a new listed hazardous waste, Petroleum Refinery Primary and Secondary Oil/Water/Solids Separations Sludge, waste code F037. 55 FR 46354 (November 2, 1990). This new rule expanded listed waste coverage to all oil/water/solids separation sludges generated at refineries. [Previously, only oily sludges generated in specific equipment, such as API separators, were listed.] The sludges covered by the listing are principally oil fractions settled or floated from refinery wastewaters. They were listed for their toxic constituents, such as benzene, chrysene, arsenic, nickel and toluene. *Id.*

On August 6, 1998, EPA listed additional refinery wastes, including spent hydroprocessing catalysts, K171 and K172. 63 FR 42110. At the same time, EPA amended the exclusions from “solid waste” to include “oil-bearing hazardous secondary materials (i.e., sludges, by-products, or spent materials)” generated at a refinery (SIC 2911) and reinserted into the refinery process. 63 FR 42184. EPA’s analysis of recycling oil-bearing materials into the “refinery process” focused

almost entirely upon insertion of oily wastewater sludges into the refinery coker. 63 FR 42122-42128.

The actual exclusion, however, seems to be far broader. It apparently includes, for example, “spent materials” (such as spent catalysts) that typically contain a maximum of 10-15% oil. Processing spent catalyst as an “oil-bearing residual” to remove 10% oil would leave 90% of the catalyst as waste. Recognizing that one could “launder” hazardous waste by removing a little oil and wind up with a non-waste residue, EPA decided that any residue from recycling oily secondary materials at a refinery would be included in waste code F037, and revised the scope of F037 accordingly. 63 FR 42185.

Unfortunately, it does not appear that EPA considered the unique hazardous properties of wastes like spent catalyst when it expanded the definition of F037. It did not, for instance, add the hazardous constituents of K171/K172, such as ignitability or vanadium, to the basis for listing F037. Nor did the agency amend the LDR to take into account the unique risks of land-disposing K171/K172. 63 FR 42185-42188. These risks include the tendency of spent catalyst to spontaneously catch fire, and the potential presence of highly soluble toxic vanadium compounds. None of these properties would be removed by “recycling” the contaminated oil into the refinery process. Accordingly, the expanded listing for F037 and the corresponding LDR for F037 are in fact based only on recycling

of oily sludges into the refinery, and do not reflect recycling of other wastes (such as K171/K172) allowed by the exclusion. *Id.*

At least one refinery has contracted with an on-site treating company to operate a thermal desorber for its oily residual waste. This refinery reportedly intends to process spent catalyst, among other residuals, in the desorber. The desorber operates at relatively low temperature, which is high enough to remove most organics, but will not convert sulfides to render catalyst non-ignitable/non-reactive. *See* Petition, Exhibit B (Scherger Report) at 17-19. Nor will the desorber remove or treat toxic metals, such as vanadium and arsenic. *Id.*

If the refinery is permitted to process spent catalyst as exempt oily residuals, it can be processed in the desorber and sent to landfill as F037. Because F037 does not carry LDR for ignitability, reactivity, arsenic or vanadium (all properties of spent catalyst), these properties do not need to be tested for, nor are there any limits preventing land disposal of spent catalyst exhibiting these properties.

If EPA did not intend to include spent hydroprocessing catalyst among those “oil-bearing residuals” subject to the exemption, it should adopt a clarifying amendment saying so. Otherwise, to remedy this situation the LDR for F037 must be revised. The Petition urged EPA to add the toxic metals arsenic and vanadium to the LDR for F037. Petition at 20.

This remedy will not solve the problem, however. The high sulfide content causes self-heating (ignitability) and long-term acid leaching in landfills. *See* Petition, Exhibit B (Scherger Report) at 14-19. Recent test results for spent resid catalyst are instructive. The samples were tested for total metals content and TCLP metals, plus additional parameters including total sulfide. The data were reviewed and compared to the LDR for K171/K172 LDR and also to the LDR for F037 and K048-52. This catalyst should be typical of the catalyst to be treated in the refinery thermal desorber mentioned above. A summary of the results is as follows [For the lab data report, *see* Exhibit B]:

<b>Catalyst 1</b>				
<b>Parameter</b>	<b>TCLP mg/l</b>	<b>K172 LDR mg/l</b>	<b>F037 LDR mg/l</b>	<b>Percent Total Concentration</b>
Antimony	N/R	1.15	----	N/R
Arsenic	<0.5	5	----	N/R
Chromium	<0.05	N/A	0.60	N/R
Nickel	265	11	11	N/R
Vanadium	90.9	1.6	----	N/R
<b>Catalyst 2</b>				
Nickel	N/R	11	11	4.49
Vanadium	N/R	1.6	----	8.35
Molybdenum	N/R	----	----	7.46
Sulfide		Deact	----	12.73

N/A – Not applicable      N/R – Not reported

The resid catalysts contain percent levels of several metals, as is expected in this type of catalyst, and also show high levels of total sulfides. Under the K171/K172 LDR the sulfides require DEACT (deactivation) treatment. Under the current LDR for K171/K172 the metals nickel and vanadium would require treatment prior to placement in a landfill. Neither the sulfides nor the vanadium would need to be treated if the catalyst were processed as (exempt) oil-bearing residue and sent directly to landfill.

It is clear from this data that the catalyst contains higher levels of metals than a typical K048-52 oily wastewater treatment residue and significantly more sulfides. While the K171/K172 LDR have the same nickel treatment requirement as F037 and the related K048-52 wastes, the catalyst LDR also include several metals, including antimony, arsenic and vanadium, that are not regulated by the F037 LDR.

Thus, by including the K171/K172 catalyst under the umbrella of “oily waste” and using F037 as the classification for the treatment process residue, this catalyst could be land-disposed without treatment for vanadium. This would also be true for arsenic and antimony. While this particular catalyst results show low TCLP results for antimony and arsenic, these metals are often present in catalyst, as demonstrated by the EPA establishing treatment standards in the LDR for catalyst waste. Thus, in addition to getting around the vanadium issue, it is also

possible that arsenic and antimony will also go untreated if a refinery uses the F037 designation for the residues of thermal desorption.

High sulfides cause the self-heating characteristics of spent hydroprocessing catalyst. 63 FR 42168. These characteristics cannot be removed without oxidation of the metallic sulfides; the temperature of a thermal desorber is too low for this to happen. *Id.* See also Petition, Exhibit B (Scherger Report) at 17-19. Therefore, the residue of thermal desorption of spent catalyst is simply de-oiled catalyst, with the ignitable/reactive characteristics unchanged.

Finally, it has come to TFA's attention that a refinery has filed a petition to delist F037 waste, which is the solid residue from the thermal desorber. Exhibit C. Petitions to delist residue from processing oily refinery sludges have in the past been granted. 58 FR 40067 (July 27, 1993) (Marathon Oil Company, Texas City, Texas); 65 FR 21651 (April 24, 2000) (Duratherm, Inc.). However both Marathon and Duratherm sought to delist residue from thermal treatment of oily wastewater sludges. In neither case did the waste processor seek to delist residue from spent hydroprocessing catalyst.

Needless to say, spent hydroprocessing catalyst is so dissimilar from refinery wastewater sludges that it should not be considered with a petition to delist the residue from treating such sludges. Also, LDRs are often considered as guidance

or criteria for delisting. Until the deficiencies with the F037 LDR are corrected, the LDR are inadequate and potentially misleading as delisting criteria.

**Revising the LDR as requested in the Petition will promote the efficient and sustainable use of resources.**

In February, 2001, the EPA-State RCRA Vision Workgroup issued a draft White Paper “*Beyond RCRA: Prospects for Waste and Material Management in the Year 2020.*” Exhibit D. The group suggested that “Goal No. 1” for future waste management programs should be reduction of waste and promoting the efficient/sustainable use of resources. White Paper at 11. The White Paper suggests, among other things, that EPA should consider “prohibitions on disposal or mandated recycling of certain types of post-consumer and/or industrial waste. *Id.* at 13.

Goal No. 2 is to prevent harmful exposure from the use of hazardous chemicals. Goal No. 3 is to manage wastes and clean up releases in a safe, environmentally sound manner. *Id.* at 14-15. The Working Group states: “Under this type of system the current “cradle to grave” approach to waste management would be supplemented by a system in which materials that are now considered wastes would be presumed to be valuable materials....” *Id.* at 15. These goals are consistent with the existing objectives of RCRA. Petition at 20-21.

EPA has previously set LDRs based upon recycling as the only BDAT treatment strategy. The agency did this in part on the grounds that recycling would recover valuable resources. See discussion of aluminum pot liner recycling, Petition at 20. See also *EPA: Land Disposal Restrictions for Third Scheduled Wastes*:

“EPA notes that it prefers to base BDAT on technologies that further the statutory goals of waste minimization and recycling. In some circumstances, EPA may select this type of technology as BDAT over more conventional treatment, provided the disparity in performance of technologies is not too pronounced and the technology selected minimizes threats to human health and the environment by substantially diminishing waste toxicity and reducing mobility of toxic constituents.” 54 FR 48381(November 22, 1989).

There are approximately 18 MM lbs. of vanadium used each year in the United States, fifty percent of which comes from imports. Seventy percent of vanadium from domestic sources (6 MM lbs.) comes from recycled material, including spent catalyst. If the same amount of domestically produced vanadium were extracted from ore, the extraction and refining of the vanadium would generate about 1.2 billion pounds of waste every year, as compared with the negligible amount of waste generated by recycling.

Because they allow landfilling of untreated or inadequately treated spent catalyst, the existing LDR promote wasteful disposal of recyclable metals, and promote disposal that is not protective of health and the environment. Adopting a

prescriptive LDR that ensures proper treatment should correct the non-protective aspect. In order to fulfill its important mission (and future goals) of recovering materials instead of throwing them away, EPA should strongly endorse mandatory recycling of spent catalyst as an LDR.

### **Conclusion**

Recent data confirms that the existing LDR for K171/K172 are inadequate to ensure proper treatment of PAH. As demonstrated in the Petition, the LDR for spent hydrotreating and hydrorefining catalysts should be revised to require proper treatment. In the case of spent catalyst, proper treatment can only be assured by adopting a prescriptive standard, either (1) High temperature oxidation followed by stabilization, or (2) recycling.

Recent experience shows that refineries consider spent hydroprocessing catalyst to be an “oil-bearing residual” subject to the exclusion from “solid waste” at 40 CFR 261.4(a)(12). If the refinery “treats” spent catalyst to remove the oil, the residuals will be classified F037. However the residue retains all of the hazardous characteristics of K171/172 except for the light organics, including reactivity/ignitability from high sulfide content, and toxic metals. If EPA did not intend the exclusion to cover spent catalyst, it should clarify the rule. As shown above, if refineries are permitted to process spent catalyst as an oil-bearing residual,

as a minimum the LDR for F037 must be amended to ensure proper treatment of the catalyst residues. In the Petition, TFA demonstrated that sampling and analytical problems are more than sufficient justification for the agency to select a prescriptive LDR for this wastes. This same justification applies to the “deoiled” catalyst: it retains the high sulfide content, but there is no recognized and approved test method to determine if the material has been “deactivated” . Accordingly, TFA urges EPA to adopt a prescriptive treatment standard for F037 that is derived from treating spent hydroprocessing catalyst.

Finally, EPA policy is moving toward implementation of RCRA to favor resource recovery. This is consistent with both the statute and the laudable notion of sustainable use of resources. EPA should further this policy by adopting LDR for spent hydroprocessing catalyst which favor recycling over land disposal. Recycling is cost-competitive with high temperature oxidation and stabilization. A prescriptive LDR specifying recycling, even with an option for high temperature oxidation and stabilization would be a major step in promotion of resource recovery of all the valuable metal values in spent catalyst.



5152 393 H

HOUSTON LABORATORY  
8990 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77064  
(713) 466-0901

K172 (MEETS LAB'S FOR 1613)

Client Sample ID Resid NI/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

TPH (I)

Analytes/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
8318 - HPLC, TNRCC LEACHATE							
Acrylamide	ND	100	1	MCL	07/20/01 15:32	YN	751037

Leach Method	Leachate Date	Leach Initials
SW1311	07/18/2001 16:03	J_G

AMMONIA (AS NITROGEN)							
Ammonia (as Nitrogen)	159	10	1	MCL	07/19/01 16:30	JS	750277

CYANIDE, TOTAL							
Cyanide	ND	0.5	1	MCL	07/19/01 17:00	ES	750006

IGNITABILITY							
Ignitability	>212	20	1	MCL	07/19/01 15:00	KM	749738

METALS BY METHOD 6010B, TNRCC LEACHATE							
Antimony	ND	0.2	2	MCL	07/19/01 22:28	EG	750806
Arsenic	ND	0.2	2	MCL	07/19/01 22:28	EG	750806
Barium	ND	2	2	MCL	07/19/01 22:28	EG	750806
Beryllium	0.0071	0.006	2	MCL	07/19/01 22:28	EG	750806
Cadmium	ND	0.02	2	MCL	07/19/01 22:28	EG	750806
Chromium	ND	0.02	2	MCL	07/19/01 22:28	EG	750806
Lead	ND	0.1	2	MCL	07/19/01 22:28	EG	750806
Nickel	33	0.04	2	MCL	07/19/01 22:28	EG	750806
Selenium	ND	0.2	2	MCL	07/19/01 22:28	EG	750806
Silver	ND	0.02	2	MCL	07/19/01 22:28	EG	750806
Vanadium	24	0.01	2	MCL	07/19/01 22:28	EG	750806

Prep Method	Prep Date	Prep Initials	Leach Method	Leachate Date	Leach Initials
SW3010A	07/19/2001 12:30	MME	SW1311	07/18/2001 16:03	J_G

METALS BY METHOD 6010B, TOTAL							
Antimony	159	10	1	MCL	07/19/01 18:43	EG	751031
Cobalt	1210	1	1	MCL	07/19/01 18:43	EG	751031
Molybdenum	12700	10	5	MCL	07/19/01 18:50	EG	750783
Nickel	15800	10	5	MCL	07/19/01 18:50	EG	750783
Vanadium	31600	2.5	5	MCL	07/19/01 18:50	EG	750783
Zinc	69.4	2	1	MCL	07/19/01 18:43	EG	751031

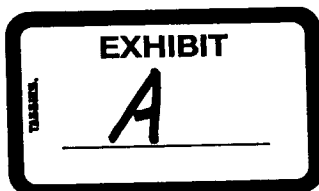
Prep Method	Prep Date	Prep Initials
SW3050B	07/18/2001 17:30	MME

MOISTURE - ASTM							
Percent Moisture	8.8	0	1	MCL	07/18/01 17:30	KM	748989

Qualifiers:  
ND/U - Not Detected at the Reporting Limit  
B - Analyte detected in the associated Method Blank  
\* - Surrogate Recovery Outside Advisable QC Limits  
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)  
D - Surrogate Recovery Unreportable due to Dilution  
MI - Matrix Interference

7/25/01 3:06:57 PM





HOUSTON LABORATORY  
8884 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 860-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp Collected: 7/18/01 2:00:00 SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
<b>PH</b>							
PH	8.6	0.10	MCL	SW9045C	Units: pH Units		
			1		07/18/01 18:10	DG	748454
<b>REACTIVE CYANIDE-SOLID</b>							
Reactive Cyanide	ND	1	MCL	SW7.3.3.1	Units: mg/Kg		
			1		07/17/01 17:00	ES	749191
<b>REACTIVE SULFIDE - SOLID</b>							
Reactive Sulfide	ND	10	MCL	SW7.3.4.2	Units: mg/Kg		
			1		07/17/01 17:00	ES	749206
<b>SEMIVOLATILE HYDROCARBONS - ALCOHOL</b>							
Methanol	ND	1	MCL	SW8015B	Units: mg/Kg		
			1		07/19/01 10:34	AR	749476

Prep Method	Prep Date	Prep Initials
SW3550B	07/18/2001 14:39	J.L.

<b>SEMIVOLATILE HYDROCARBONS - GLYCOL</b>							
2-Ethoxy ethanol	ND	20	MCL	SW8015B	Units: mg/L		
			1		07/20/01 11:59	AR	751074
2-Methoxy ethanol	ND	20			07/20/01 11:59	AR	751074
Ethylene Glycol	ND	20			07/20/01 11:59	AR	751074
Surr: Triethylene Glycol	51.1	% 50-150			07/20/01 11:59	AR	751074

Qualifiers: NDAU - Not Detected at the Reporting Limit  
B - Analyte detected in the associated Method Blank  
\* - Surrogate Recovery Outside Advisable QC Limits  
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)  
D - Surrogate Recovery Unreportable due to Dilution  
MI - Matrix Interference

7/25/01 3:06:58 PM



HOUSTON LABORATORY  
3980 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 996-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00 SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	DL Factor	QUAL	Date Analyzed	Analyst	Seq. #
SEMIVOLATILE ORGANICS BY METHOD 8270C			MCL	SWB270C	Units: ug/Kg		
1,2,4,5-Tetrachlorobenzene	ND J	26000		80	07/20/01 18:57	S_G	753973
1,2,4-Trichlorobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,2-Dichlorobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,2-Diphenylhydrazine	ND	26000		80	07/20/01 18:57	S_G	753973
1,3,5-Trinitrobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,3-Dichlorobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,4-Dichlorobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,4-Dinitrobenzene	ND	26000		80	07/20/01 18:57	S_G	753973
1,4-Naphthoquinone	ND	130000		80	07/20/01 18:57	S_G	753973
1-Chloronaphthalene	ND	26000		80	07/20/01 18:57	S_G	753973
1-Nitropyrene	ND J	26000		80	07/20/01 18:57	S_G	753973
2,3,4,6-Tetrachlorophenol	ND J	26000		80	07/20/01 18:57	S_G	753973
2,4,5-Trichlorophenol	ND	64000		80	07/20/01 18:57	S_G	753973
2,4,6-Trichlorophenol	ND	26000		80	07/20/01 18:57	S_G	753973
2,4-Dichlorophenol	ND	26000		80	07/20/01 18:57	S_G	753973
2,4-Dimethylphenol	10000 J	26000		80	07/20/01 18:57	S_G	753973
2,4-Dinitrophenol	ND	64000		80	07/20/01 18:57	S_G	753973
2,4-Dinitrotoluene	ND	26000		80	07/20/01 18:57	S_G	753973
2,6-Dichlorophenol	ND	26000		80	07/20/01 18:57	S_G	753973
2,6-Dinitrotoluene	ND	26000		80	07/20/01 18:57	S_G	753973
2-Acetylaminofluorene	ND J	53000		80	07/20/01 18:57	S_G	753973
2-Chloronaphthalene	ND	26000		80	07/20/01 18:57	S_G	753973
2-Chlorophenol	ND	26000		80	07/20/01 18:57	S_G	753973
2-Methylfluoranthene	ND J	26000		80	07/20/01 18:57	S_G	753973
2-Naphthylamine	ND J	26000		80	07/20/01 18:57	S_G	753973
2-Nitroaniline	ND	64000		80	07/20/01 18:57	S_G	753973
2-Nitrophenol	ND	26000		80	07/20/01 18:57	S_G	753973
2-sec-Butyl-4,6-dinitrophenol	ND J	26000		80	07/20/01 18:57	S_G	753973
2-Toluidine	ND J	70000		80	07/20/01 18:57	S_G	753973
3,3'-Dimethylbenzidine	ND	70000		80	07/20/01 18:57	S_G	753973
3-Methylcholanthrene	ND J	26000		80	07/20/01 18:57	S_G	753973
4,4'-Methylenebis(2-chloroaniline)	ND J	26000		80	07/20/01 18:57	S_G	753973
4,6-Dinitro-2-methylphenol	ND	64000		80	07/20/01 18:57	S_G	753973
4-Aminobiphenyl	ND J	26000		80	07/20/01 18:57	S_G	753973
4-Bromophenyl phenyl ether	ND	26000		80	07/20/01 18:57	S_G	753973
4-Chloro-3-methylphenol	ND	26000		80	07/20/01 18:57	S_G	753973
4-Chloroaniline	ND	26000		80	07/20/01 18:57	S_G	753973
4-Nitroaniline	ND	64000		80	07/20/01 18:57	S_G	753973
4-Nitrophenol	ND	64000		80	07/20/01 18:57	S_G	753973
4-Nitroquinoline-1-oxide	ND J	26000		80	07/20/01 18:57	S_G	753973

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

\* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)

D - Surrogate Recovery Unreportable due to Dilution

MI - Matrix Interference

7/25/01 3:08:58 PM



HOUSTON LABORATORY  
8880 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 980-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep. Limit	Det. Factor	QUAL	Date Analyzed	Analyst	Seq. #
5-Nitro-o-toluidine	ND J	26000	80		07/20/01 18:57	S_G	753973
7,12-Dimethylbenz(a)anthracene	ND J	26000	80		07/20/01 18:57	S_G	753973
7H-Dibenzo (c,g) carbazole	ND J	26000	80		07/20/01 18:57	S_G	753973
Acenaphthene	ND	26000	80		07/20/01 18:57	S_G	753973
Acenaphthylene	ND	26000	80		07/20/01 18:57	S_G	753973
Acetophenone	ND J	26000	80		07/20/01 18:57	S_G	753973
Aniline	ND	26000	80		07/20/01 18:57	S_G	753973
Anthracene	54000	26000	80		07/20/01 18:57	S_G	753973
Aramite	ND J	26000	80		07/20/01 18:57	S_G	753973
Benz(a)anthracene	ND	26000	80		07/20/01 18:57	S_G	753973
Benzal Chloride	ND J	26000	80		07/20/01 18:57	S_G	753973
Benzo (j) fluoranthene	ND J	26000	80		07/20/01 18:57	S_G	753973
Benzo (rst) pentaphene	ND J	26000	80		07/20/01 18:57	S_G	753973
Benzo(a)pyrene	ND	26000	80		07/20/01 18:57	S_G	753973
Benzo(b)fluoranthene	ND	26000	80		07/20/01 18:57	S_G	753973
Benzo(g,h,i)perylene	ND	26000	80		07/20/01 18:57	S_G	753973
Benzo(k)fluoranthene	ND	26000	80		07/20/01 18:57	S_G	753973
Bis(2-chloroethoxy)methane	ND	26000	80		07/20/01 18:57	S_G	753973
Bis(2-chloroethyl)ether	ND	26000	80		07/20/01 18:57	S_G	753973
Bis(2-chloroisopropyl)ether	ND	26000	80		07/20/01 18:57	S_G	753973
Bis(2-ethylhexyl)phthalate	ND	26000	80		07/20/01 18:57	S_G	753973
Butyl benzyl phthalate	ND	26000	80		07/20/01 18:57	S_G	753973
Carbazole	28000	26000	80		07/20/01 18:57	S_G	753973
Chlorobenzilate	ND J	26000	80		07/20/01 18:57	S_G	753973
Chrysene	13000 J	26000	80		07/20/01 18:57	S_G	753973
Di-n-butyl phthalate	ND	26000	80		07/20/01 18:57	S_G	753973
Di-n-octyl phthalate	ND	26000	80		07/20/01 18:57	S_G	753973
Dibenz(a,h)acridine	ND J	53000	80		07/20/01 18:57	S_G	753973
Dibenz(a,h)anthracene	ND	26000	80		07/20/01 18:57	S_G	753973
Dibenz(a,j)acridine	ND J	53000	80		07/20/01 18:57	S_G	753973
Dibenz(a,j)anthracene	ND J	26000	80		07/20/01 18:57	S_G	753973
Dibenzo (a,i) pyrene	ND J	26000	80		07/20/01 18:57	S_G	753973
Dibenzo(a,e)fluoranthene	ND J	26000	80		07/20/01 18:57	S_G	753973
Dibenzo(a,e)pyrene	ND J	26000	80		07/20/01 18:57	S_G	753973
Dibenzo(a,h)pyrene	ND J	24000	80		07/20/01 18:57	S_G	753973
Dibenzo(a,i)pyrene	ND J	26000	80		07/20/01 18:57	S_G	753973
Diethyl phthalate	ND	26000	80		07/20/01 18:57	S_G	753973
Diphenylamine	ND J	26000	80		07/20/01 18:57	S_G	753973
Famphur	ND J	26000	80		07/20/01 18:57	S_G	753973
Fluoranthene	39000	26000	80		07/20/01 18:57	S_G	753973
Fluorene	15000 J	26000	80		07/20/01 18:57	S_G	753973
Hexachlorobenzene	ND	26000	80		07/20/01 18:57	S_G	753973

Qualifiers:

ND/U - Not Detected at the Reporting Limit  
B - Analyte detected in the associated Method Blank  
\* - Surrogate Recovery Outside Advisable QC Limits  
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)  
D - Surrogate Recovery Unreportable due to Dilution  
MI - Matrix Interference



HOUSTON LABORATORY  
9900 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77064  
(713) 660-6001

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Hexachlorobutadiene	ND	26000	80		07/20/01 18:57	S_G	753973
Hexachlorocyclopentadiene	ND	26000	80		07/20/01 18:57	S_G	753973
Hexachloroethane	ND	26000	80		07/20/01 18:57	S_G	753973
Hexachloropropene	ND J	26000	80		07/20/01 18:57	S_G	753973
Indeno(1,2,3-cd)pyrene	ND	26000	80		07/20/01 18:57	S_G	753973
Isodrin	ND J	26000	80		07/20/01 18:57	S_G	753973
Isosafrole	ND J	26000	80		07/20/01 18:57	S_G	753973
Kepon	ND J	26000	80		07/20/01 18:57	S_G	753973
Methapyrilene	ND J	26000	80		07/20/01 18:57	S_G	753973
Methyl methanesulfonate	ND J	53000	80		07/20/01 18:57	S_G	753973
Methylchrysene	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitroso-di-n-butylamine	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosodi-n-propylamine	ND	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosodimethylamine	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosodimethylamine	ND	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosodiphenylamine	ND	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosomethylethylamine	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosomorpholine	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitropiperidine	ND J	26000	80		07/20/01 18:57	S_G	753973
N-Nitrosopyrrolidine	ND J	26000	80		07/20/01 18:57	S_G	753973
Naphthalene	ND	26000	80		07/20/01 18:57	S_G	753973
Nitrobenzene	ND	26000	80		07/20/01 18:57	S_G	753973
o-Toluidine	ND	64000	80		07/20/01 18:57	S_G	753973
p-Dimethylaminosobenzene	ND J	130000	80		07/20/01 18:57	S_G	753973
p-Phenylenediamine	ND J	130000	80		07/20/01 18:57	S_G	753973
Pentachlorobenzene	ND J	26000	80		07/20/01 18:57	S_G	753973
Pentachloroethane	ND J	26000	80		07/20/01 18:57	S_G	753973
Pentachloronitrobenzene	ND J	26000	80		07/20/01 18:57	S_G	753973
Pentachlorophenol	ND	64000	80		07/20/01 18:57	S_G	753973
Phenacetin	ND J	26000	80		07/20/01 18:57	S_G	753973
Phenanthrene	150000	26000	80		07/20/01 18:57	S_G	753973
Phenol	ND	26000	80		07/20/01 18:57	S_G	753973
Phorate	ND J	26000	80		07/20/01 18:57	S_G	753973
Phthalic Acid	ND J	26000	80		07/20/01 18:57	S_G	753973
Phthalic anhydride	ND J	26000	80		07/20/01 18:57	S_G	753973
Proxamide	ND J	26000	80		07/20/01 18:57	S_G	753973
Pyrene	38000	26000	80		07/20/01 18:57	S_G	753973
Pyridine	ND	26000	80		07/20/01 18:57	S_G	753973
Safrole	ND J	26000	80		07/20/01 18:57	S_G	753973
Tris(2,3-dibromopropyl) phosphate	ND J	26000	80		07/20/01 18:57	S_G	753973
2-Methylphenol	7300 J	26000	80		07/20/01 18:57	S_G	753973
3 & 4-Methylphenol	ND	26000	80		07/20/01 18:57	S_G	753973

Qualifiers:

ND/U - Not Detected at the Reporting Limit  
B - Analyte detected in the associated Method Blank  
+ - Surrogate Recovery Outside Advisable QC Limits  
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)  
D - Surrogate Recovery Unreportable due to Dilution  
MI - Matrix Interference

7/25/01 3:06:59 PM



HOUSTON LABORATORY  
5830 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 660-6901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep. Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Cresols, Total	ND	26000	80		07/20/01 18:57	S_G	753973
Surr: 2,4,6-Tribromophenol	D	% 19-122	80	*	07/20/01 18:57	S_G	753973
Surr: 2-Fluorobiphenyl	D	% 30-115	80	*	07/20/01 18:57	S_G	753973
Surr: 2-Fluorophenol	D	% 25-121	80	*	07/20/01 18:57	S_G	753973
Surr: Nitrobenzene-d5	D	% 23-120	80	*	07/20/01 18:57	S_G	753973
Surr: Phenol-d5	D	% 24-113	80	*	07/20/01 18:57	S_G	753973
Surr: Terphenyl-d14	D	% 18-137	80	*	07/20/01 18:57	S_G	753973

Prep Method	Prep Date	Prep Initials
SW3550B	07/19/2001 11:30	EE

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

\* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)

D - Surrogate Recovery Unreportable due to Dilution

Mi - Matrix Interference

7/25/01 3:08:58 PM



HOUSTON LABORATORY  
8330 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 664-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070540-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	Det. Factor	QUAL	Date Analyzed	Analyst	Seq. #
<b>SEMIVOLATILES, TNRC LEACHATE</b>							
			<b>MCL</b>	<b>SW8270C</b>	<b>Units: ug/L</b>		
1,2,4-Trichlorobenzene	ND	5	1		07/20/01 20:30	S_G	754155
1,2-Diphenylhydrazine	ND	5	1		07/20/01 20:30	S_G	754155
1,3-Dinitrobenzene	ND	10	1		07/20/01 20:30	S_G	754155
1,4-Dichlorobenzene	ND	5	1		07/20/01 20:30	S_G	754155
2,3,4,6-Tetrachlorophenol	ND	10	1		07/20/01 20:30	S_G	754155
2,4,5-Trichlorophenol	ND	10	1		07/20/01 20:30	S_G	754155
2,4,6-Trichlorophenol	ND	5	1		07/20/01 20:30	S_G	754155
2,4-Dichlorophenol	ND	5	1		07/20/01 20:30	S_G	754155
2,4-Dimethylphenol	70	5	1		07/20/01 20:30	S_G	754155
2,4-Dinitrophenol	ND	25	1		07/20/01 20:30	S_G	754155
2,4-Dinitrotoluene	ND	5	1		07/20/01 20:30	S_G	754155
2,6-Dimethylphenol	ND	5	1		07/20/01 20:30	S_G	754155
2,6-Dinitrotoluene	ND	5	1		07/20/01 20:30	S_G	754155
2-Chlorophenol	ND	5	1		07/20/01 20:30	S_G	754155
3,3'-Dichlorobenzidine	ND	10	1		07/20/01 20:30	S_G	754155
4-Chloro-3-methylphenol	ND	5	1		07/20/01 20:30	S_G	754155
Acenaphthene	ND	5	1		07/20/01 20:30	S_G	754155
Acetophenone	ND	10	1		07/20/01 20:30	S_G	754155
Aniline	ND	5	1		07/20/01 20:30	S_G	754155
Anthracene	ND	5	1		07/20/01 20:30	S_G	754155
Benzidine	ND	20	1		07/20/01 20:30	S_G	754155
Bis(2-chloroethyl)ether	ND	5	1		07/20/01 20:30	S_G	754155
Bis(2-ethylhexyl)phthalate	ND	5	1		07/20/01 20:30	S_G	754155
Butyl benzyl phthalate	ND	5	1		07/20/01 20:30	S_G	754155
Di-n-butyl phthalate	ND	5	1		07/20/01 20:30	S_G	754155
Diethyl phthalate	ND	5	1		07/20/01 20:30	S_G	754155
Diphenylamine	ND	10	1		07/20/01 20:30	S_G	754155
Fluoranthene	ND	5	1		07/20/01 20:30	S_G	754155
Fluorene	ND	5	1		07/20/01 20:30	S_G	754155
Hexachlorobenzene	ND	5	1		07/20/01 20:30	S_G	754155
Hexachlorobutadiene	ND	5	1		07/20/01 20:30	S_G	754155
Hexachlorocyclopentadiene	ND	5	1		07/20/01 20:30	S_G	754155
Hexachloroethene	ND	5	1		07/20/01 20:30	S_G	754155
Hexachlorophene	ND	1000	1		07/20/01 20:30	S_G	754155
Isophorone	ND	5	1		07/20/01 20:30	S_G	754155
N-Nitroso-di-n-butylamine	ND	10	1		07/20/01 20:30	S_G	754155
N-Nitroso-di-n-propylamine	ND	5	1		07/20/01 20:30	S_G	754155
N-Nitrosodiphenylamine	ND	5	1		07/20/01 20:30	S_G	754155
N-Nitrosomethylethylamine	ND	5	1		07/20/01 20:30	S_G	754155
N-Nitrosopyrrolidine	ND	10	1		07/20/01 20:30	S_G	754155

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

\* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and FGL

>MCL - Result Over Maximum Contamination Limit(MCL)

D - Surrogate Recovery Unreportable due to Dilution

Mi - Matrix Interference

7/25/01 2:07:00 PM



HOUSTON LABORATORY  
8880 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77056  
(713) 690-9991

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00

SPL Sample ID: 01070840-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep. Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Nitrobenzene	ND	5	1		07/20/01 20:30	S_G	754155
p-Phenylenediamine	ND	50	1		07/20/01 20:30	S_G	754155
Pentachlorobenzene	ND	10	1		07/20/01 20:30	S_G	754155
Pentachloronitrobenzene	ND	10	1		07/20/01 20:30	S_G	754155
Pentachlorophenol	ND	25	1		07/20/01 20:30	S_G	754155
Phenol	12	5	1		07/20/01 20:30	S_G	754155
Pronamide	ND	10	1		07/20/01 20:30	S_G	754155
Pyrene	ND	5	1		07/20/01 20:30	S_G	754155
Pyridine	ND	5	1		07/20/01 20:30	S_G	754155
2-Methylphenol	52	5	1		07/20/01 20:30	S_G	754155
3 & 4-Methylphenol	38	10	1		07/20/01 20:30	S_G	754155
Surr: 2,4,5-Tribromophenol	64.0 %	10-123	1		07/20/01 20:30	S_G	754155
Surr: 2-Fluorobiphenyl	62.0 %	43-116	1		07/20/01 20:30	S_G	754155
Surr: 2-Fluorophenol	61.3 %	21-110	1		07/20/01 20:30	S_G	754155
Surr: Nitrobenzene-d5	48.0 %	35-114	1		07/20/01 20:30	S_G	754155
Surr: Phenol-d5	62.7 %	10-110	1		07/20/01 20:30	S_G	754155
Surr: Terphenyl-d14	58.0 %	33-141	1		07/20/01 20:30	S_G	754155

Prep Method	Prep Date	Prep Initials	Leach Method	Leach Date	Leach Initials
SW3510B	07/17/2001 12:36	KL	SW1311	07/18/2001 16:03	J_G

## SPECIFIC GRAVITY

Specific Gravity	MCL	ASTM D-1428	Units: @ 25 C
2.021	0	1	07/20/01 15:03 ES 750840

## SULFIDE, TOTAL

Sulfide	MCL	SW9030B	Units: mg/Kg
2080	250	50	07/19/01 17:00 ES 749958

## TNRCC LEACHATE MERCURY

Mercury	MCL	SW7470A	Units: mg/L
ND	0.0002	0.2	07/20/01 15:21 R_T 751237

Prep Method	Prep Date	Prep Initials	Leach Method	Leach Date	Leach Initials
SW7470A	07/20/2001 11:30	R_T	SW1311	07/18/2001 16:03	J_G

## TOTAL CARBON BY MODIFIED 415.1

Carbon, Total	MCL	E415.1	Units: mg/L
93.2	1	1	07/19/01 20:00 KM 749751

## TOTAL PETROLEUM HYDROCARBONS

Petroleum Hydrocarbons, TR	MCL	E418.1	Units: mg/Kg
30000	250	25	07/19/01 13:15 HH 749230

Prep Method	Prep Date	Prep Initials
	07/19/2001 11:00	

## Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

\* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

&gt;MCL - Result Over Maximum Contamination Limit(MCL)

D - Surrogate Recovery Unreportable due to Dilution

MI - Matrix Interference

7/25/01 3:07:01 PM



HOUSTON LABORATORY  
8990 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77064  
(713) 666-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00 SPL Sample ID: 01070840-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
<b>VOLATILE ORGANICS BY METHOD 8260B</b>			<b>MCL</b>	<b>SW8260B</b>	<b>Units: ug/Kg</b>		
1,2,4-Trimethylbenzene	1200	620		125	07/22/01 18:09	JC	754302
1,3-Butadiene	ND	620		125	07/22/01 18:09	JC	754302
2,2,4-Trimethylpentane	ND	620		125	07/22/01 18:09	JC	754302
Benzene	ND	620		125	07/22/01 18:09	JC	754302
Cyclohexane	700	620		125	07/22/01 18:09	JC	754302
Dicyclopentadiene	ND	1200		125	07/22/01 18:09	JC	754302
Ethylbenzene	ND	620		125	07/22/01 18:09	JC	754302
Hexane	1100	620		125	07/22/01 18:09	JC	754302
Isopropylbenzene	ND	620		125	07/22/01 18:09	JC	754302
Methyl tert-butyl ether	ND	620		125	07/22/01 18:09	JC	754302
n-Butyl alcohol	ND	62000		125	07/22/01 18:09	JC	754302
Toluene	1000	620		125	07/22/01 18:09	JC	754302
m,p-Xylene	1100	620		125	07/22/01 18:09	JC	754302
o-Xylene	ND	620		125	07/22/01 18:09	JC	754302
Xylenes, Total	1100	620		125	07/22/01 18:09	JC	754302
Surr: 1,2-Dichloroethane-d4	84.8	% 70-120		125	07/22/01 18:09	JC	754302
Surr: 4-Bromofluorobenzene	94.4	% 74-130		125	07/22/01 18:09	JC	754302
Surr: Toluene-d8	99.2	% 60-140		125	07/22/01 18:09	JC	754302

Qualifiers:

ND/U - Not Detected at the Reporting Limit

B - Analyte detected in the associated Method Blank

\* - Surrogate Recovery Outside Advisable QC Limits

J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)

D - Surrogate Recovery Unreportable due to Dilution

MI - Matrix Interference

7/25/01 3:07:01 PM



HOUSTON LABORATORY  
8900 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 469-0901

Client Sample ID Resid Ni/Mo Catalyst-Comp

Collected: 7/18/01 2:00:00 SPL Sample ID: 01070840-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep. Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
<b>VOLATILES, TNRCG LEACHATE</b>			<b>MCL</b>	<b>SW8260B</b>	<b>Units: ug/L</b>		
1,1,1,2-Tetrachloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,1,1-Trichloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,1,2,2-Tetrachloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,1,2-Trichloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,1-Dichloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,2,3-Trichloropropane	ND	5	1		07/19/01 17:26	JN	751069
1,2,4-Trichlorobenzene	ND	5	70000	1	07/19/01 17:26	JN	751069
1,2-Dibromoethane	ND	4	1		07/19/01 17:26	JN	751069
1,2-Dichloroethane	ND	5	1		07/19/01 17:26	JN	751069
1,4-Dichlorobenzene	ND	5	7500	1	07/19/01 17:26	JN	751069
1,4-Dioxane	ND	500	1		07/19/01 17:26	JN	751069
2-Butanone	ND	20	1		07/19/01 17:26	JN	751069
4-Methyl-2-pentanone	ND	10	1		07/19/01 17:26	JN	751069
Acetone	ND	100	1		07/19/01 17:26	JN	751069
Acetonitrile	ND	100	1		07/19/01 17:26	JN	751069
Acrylonitrile	ND	50	1		07/19/01 17:26	JN	751069
Benzene	ND	5	1		07/19/01 17:26	JN	751069
Bromodichloromethane	ND	5	1		07/19/01 17:26	JN	751069
Bromoform	ND	5	1		07/19/01 17:26	JN	751069
Bromomethane	ND	10	1		07/19/01 17:26	JN	751069
Carbon disulfide	ND	5	1		07/19/01 17:26	JN	751069
Carbon tetrachloride	ND	5	1		07/19/01 17:26	JN	751069
Chlorobenzene	ND	5	1		07/19/01 17:26	JN	751069
Chloroform	ND	5	1		07/19/01 17:26	JN	751069
cis-1,3-Dichloropropene	ND	5	1		07/19/01 17:26	JN	751069
Cyclohexanone	ND	500	1		07/19/01 17:26	JN	751069
Dichlorodifluoromethane	ND	10	1		07/19/01 17:26	JN	751069
Ethylbenzene	ND	5	1		07/19/01 17:26	JN	751069
Isobutyl alcohol	ND	500	1		07/19/01 17:26	JN	751069
Methacrylonitrile	ND	20	1		07/19/01 17:26	JN	751069
Methylene chloride	ND	5	1		07/19/01 17:26	JN	751069
Styrene	ND	5	1		07/19/01 17:26	JN	751069
Tetrachloroethene	ND	5	1		07/19/01 17:26	JN	751069
Toluene	ND	5	1		07/19/01 17:26	JN	751069
trans-1,3-Dichloropropene	ND	5	1		07/19/01 17:26	JN	751069
Trichloroethene	ND	5	1		07/19/01 17:26	JN	751069
Trichlorofluoromethane	ND	5	1		07/19/01 17:26	JN	751069
Vinyl chloride	ND	10	1		07/19/01 17:26	JN	751069
Xylenes, Total	ND	5	1		07/19/01 17:26	JN	751069
Sum: 1,2-Dichloroethane-d4	82.0	% 62-119	1		07/19/01 17:26	JN	751069

Qualifiers: NDAU - Not Detected at the Reporting Limit  
B - Analyte detected in the associated Method Blank  
\* - Surrogate Recovery Outside Advisable QC Limits  
J - Estimated Value between MDL and PQL

>MCL - Result Over Maximum Contamination Limit(MCL)  
D - Surrogate Recovery Unreportable due to Dilution  
MI - Matrix Interference

7/25/01 3:07:02 PM



HOUSTON LABORATORY  
2500 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
(713) 660-0901

Client Sample ID: Resid Ni/Mo Catalyst-Comp      Collected: 7/18/01 2:00:00      SPL Sample ID: 01070640-01

Site: TCLP/SARA Parameters

Analyses/Method	Result	Rep.Limit	Dil. Factor	QUAL	Date Analyzed	Analyst	Seq. #
Surr: 4-Bromofluorobenzene	86.0	% 78-123	1		07/18/01 17:26	JN	751069
Surr: Toluene-d8	96.0	% 74-122	1		07/19/01 17:26	JN	751069

Leach Method	Leachate Date	Leach Initials
SW1311	07/18/2001 16:02	J_G

Qualifiers:      ND/U - Not Detected at the Reporting Limit      >MCL - Result Over Maximum Contamination Limit(MCL)  
                 B - Analyte detected in the associated Method Blank      D - Surrogate Recovery Unreportable due to Dilution  
                 \* - Surrogate Recovery Outside Advisable QC Limits      MI - Matrix Interference  
                 J - Estimated Value between MDL and PQL

7/25/01 3:07:02 PM

\*\* TOTAL PAGE.12 \*\*

Lab Project Number: 8523473

Client Project ID: TCLP metals 81-292

Solid results are reported on a wet weight basis

Lab Sample No: 851712081

Project Sample Number: 8523473-001

Date Collected: 09/20/01 00:00

Client Sample ID: [REDACTED]

Matrix: Soil

Date Received: 09/25/01 09:00

Parameters	Results	Units	Report Limit	Dilution	Analyzed	CAS No.	Flnote	Reg Limit
<b>Metals</b>								
TCLP on Solid, ICP Metals	Prep/Method: EPA 3010 / EPA 6010							
Arsenic	ND	mg/l	0.500	10.0	09/28/01	PBAR 7440-38-2		5
Barium	0.146	mg/l	0.100	10.0	09/28/01	PBAR 7440-39-3		100
Cadmium	ND	mg/l	0.0500	10.0	09/28/01	PBAR 7440-43-9		1
Chromium	ND	mg/l	0.0500	10.0	09/28/01	PBAR 7440-47-3		5
Lead	ND	mg/l	0.500	10.0	09/28/01	PBAR 7439-92-1		5
Nickel	265.	mg/l	0.100	10.0	09/28/01	PBAR 7440-02-0		1
Selenium	ND	mg/l	0.500	10.0	09/28/01	PBAR 7782-49-2		5
Silver	ND	mg/l	0.500	10.0	09/28/01	PBAR 7440-22-4		1
Vanadium	90.9	mg/l	0.0500	10.0	09/28/01	PBAR 7440-62-2		5
Date Digested					09/26/01			
Mercury, TCLP Leachate, Solid	Prep/Method: EPA 7470 / EPA 7470							
Mercury	ND	ug/l	6.00	1.0	09/27/01	BKIR 7439-97-6		200

Date: 09/28/01

Page: 1

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EXHIBIT

B

Lab Project Number: 8523473

Client Project ID: TCLP metals [REDACTED] 81-292

---

**PARAMETER FOOTNOTES**

ND Not Detected  
NC Not Calculable

Date: 09/28/01

Page: 2

**REPORT OF LABORATORY ANALYSIS**

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## QUALITY CONTROL DATA

Lab Project Number: 8523473  
Client Project ID: TCLP metals [REDACTED] 2-81-292

QC Batch: 58389  
QC Batch Method: EPA 7470  
Associated Lab Samples: 851712081

Analysis Method: EPA 7470  
Analysis Description: Mercury, TCLP Leachate, Solid

METHOD BLANK: 851712410  
Associated Lab Samples: 851712081

Parameter	Units	Blank Result	Reporting Limit	Footnotes
Mercury	ug/l	ND	6.00	

LABORATORY CONTROL SAMPLE: 851712411

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	Footnotes
Mercury	ug/l	60	58.23	97	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 851712412 851712413

Parameter	Units	851712081 Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	RPD	Footnotes
Mercury	ug/l	0.1800	60.00	57.09	57.30	95	95	0	

Date: 09/28/01

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## REPORT OF LABORATORY ANALYSIS

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## QUALITY CONTROL DATA

Lab Project Number: 8523473  
Client Project ID: TCLP metals, [REDACTED] 81-292

QC Batch: 58358  
QC Batch Method: EPA 3010  
Associated Lab Samples: 851712081

Analysis Method: EPA 6010  
Analysis Description: TCLP on Solid, ICP Metals

METHOD BLANK: 851712215  
Associated Lab Samples: 851712081

Parameter	Units	Blank Result	Reporting Limit	Footnotes
Arsenic	mg/l	ND	0.500	
Barium	mg/l	ND	0.100	
Cadmium	mg/l	ND	0.0500	
Chromium	mg/l	ND	0.0500	
Lead	mg/l	ND	0.500	
Nickel	mg/l	ND	0.100	
Selenium	mg/l	ND	0.500	
Silver	mg/l	ND	0.500	
Vanadium	mg/l	ND	0.0500	

LABORATORY CONTROL SAMPLE: 851712216

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	Footnotes
Arsenic	mg/l	2.500	2.764	111	
Barium	mg/l	2.500	2.738	110	
Cadmium	mg/l	2.500	2.801	112	
Chromium	mg/l	2.500	2.833	113	
Lead	mg/l	2.500	2.730	109	
Selenium	mg/l	2.500	2.840	114	
Silver	mg/l	2.500	2.970	119	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 851712217 851712218

Parameter	Units	851712081 Result	Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	RPD	Footnotes
Arsenic	mg/l	0.03302	2.500	2.846	2.837	112	112	0	
Barium	mg/l	0.1465	2.500	2.876	2.923	109	111	2	

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## QUALITY CONTROL DATA

Lab Project Number: 8523473

Client Project ID: TCLP metals [REDACTED] 81-292

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 851712217 851712218

Parameter	Units	851712081	Spike	MS	MSD	MS	MSD	RPD	Footnotes
		Result	Conc.	Result	Result	% Rec	% Rec		
Cadmium	mg/l	0.00482	2.500	2.812	2.814	112	112	0	
Chromium	mg/l	0.03086	2.500	2.870	2.887	114	114	1	
Lead	mg/l	0	2.500	2.976	3.007	119	120	1	
Selenium	mg/l	0.03610	2.500	2.804	2.787	111	110	1	
Silver	mg/l	0	2.500	3.282	3.320	131	133	1	1

Date: 09/28/01

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## REPORT OF LABORATORY ANALYSIS

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Lab Project Number: 8523473

Client Project ID: TCLP metals [REDACTED]-81-292

---

**QUALITY CONTROL DATA PARAMETER FOOTNOTES**

Consistent with EPA guidelines, unrounded concentrations are displayed and have been used to calculate % Rec and RPD values.

LCS(D)Laboratory Control Sample (Duplicate)

MS(D)Matrix Spike (Duplicate)

DUP Sample Duplicate

ND Not Detected

NC Not Calculable

RPD Relative Percent Difference

[1] Due to matrix interference the matrix spike and/or matrix spike duplicate do not provide reliable % Recovery and RPD values. Sample results for this QC batch accepted based on LCS and/or LCSD % Recovery and/or RPD values.

## **REPORT OF LABORATORY ANALYSIS**

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## QUALITY CONTROL DATA

### CROSS REFERENCE TABLE

Lab Project Number: 8523473

Client Project ID: TCLP metals, [REDACTED] -81-292

Lab Sample No Identifier -----	Client Sample Identifier -----	QC Batch Method -----	QC Batch Identifier -----	Analytical Method -----	Analytical Batch Identifier -----
851712081	[REDACTED]	EPA 7470	58389		
851712081	[REDACTED]	EPA 3010	58358	EPA 6010	58400

Date: 09/28/01

Page: 7

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LDEQ-OES

MAIN FILE

MOTIVA

ENTERPRISES LLC  
Shell, Texaco & Sulfur America Working Together

original to RC-52

copy to WAS/Schuerman

00 NOV -1 P4:01

October 31, 2000

PERMITS DIVISION

Dr. Judy Schuerman, Environmental Specialist  
Louisiana Department of Environmental Quality  
P.O. Box 82135  
Baton Rouge, LA 70884-2135

Michael Beck 765-0899

SUBJECT: TRANSMITTAL - PETITION FOR EXCLUSION OF A HAZARDOUS WASTE  
PURSUANT TO LAC 33: I. 907 AND LAC 33: V. 105 M  
NORCO OIL RECOVERY FACILITY  
NORCO, LOUISIANA (EPA ID# LAD 008186579)

DEAR DR. SCHUERMAN:

Enclosed please find 3 copies of *Petition for Exclusion of a Hazardous Waste Pursuant to LAC 33: I. 907 and LAC 33: V. 105 M*, submitted by Motiva Enterprises LLC. This petition details the results of our program that demonstrated that residual solids generated from oily process materials recycled at our Norco Oil Recovery Facility (NORF) neither exhibit characteristics of hazardous wastes, nor contain constituents for which the material was originally listed as F037 at levels above regulatory concern. In addition, sampling and analysis demonstrated that these residual solids are treated during recycling operations so they do not contain any Appendix IX constituents above levels of regulatory concern, and should not be regulated as a hazardous waste.

Delisting this material will:

- reduce transportation and land disposal of hazardous waste;
- encourage recycling activities to recover oil for refinery feedstock;
- promote pollution prevention in Louisiana by reducing the volume and toxicity of waste generated; and
- enhance the viability of retaining this recycling capability at Norco.

Motiva appreciates your assistance in this effort. If you have any questions during your review of our Petition, or need additional information, please contact Mr. Fred Goodson at the Norco Refinery, (504)-465-7609.

Sincerely,



A. K. Menard  
Manager Safety, Health and Environmental

Attachments

Norco Refining

P. O. Box 10

15536 River Road

Norco, LA 70079

ADM. SUPPORT  
LOG NO.

INITIALS/DATE

FEE REC'D

YES

NO

AMT. REC'D

CHECK NO.

CHECK DATE

EXHIBIT

C

41-161

**PETITION FOR EXCLUSION OF A  
HAZARDOUS WASTE  
PURSUANT TO  
LAC 33: I. 907 and LAC 33: V. 105 M  
AT THE  
NORCO OIL RECOVERY FACILITY  
NORCO, LOUISIANA**

**VOLUME 1 – TEXT, TABLES, AND FIGURES**

**MOTIVA ENTERPRISES LLC  
NORCO, LOUISIANA**

**EPA ID# LAD 008186579**

**OCTOBER 2000**

*Prepared for:*

**Motiva Enterprises, LLC**

*Prepared By:*



**Apex Environmental, Inc.**  
101 Bradford Road, Suite 200  
Wexford, Pennsylvania 15090  
(724) 935-6999

DELISTING PETITION

2

cc: File 700-09-03a (RC-EC).

bc W/O Attachment: (via e-mail)

Motiva Norco Refinery

A. K. Menard

J. A. King

D. L. Mc Neill

C. A. Medley

T. A. Kirkley

Shell Chemical Company

D. M. Baker

R. B. Kuehn

F. P. Goodson

J. R. Armstrong

A. W. Pearce

Philip Services

Stephen Bone

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    - E-3-E Sampling Event # 5 (Stabilization – BP America, Inc. Samples # 3, 4, & 5 – 7/5-7/00)
- F Delisting Demonstration Analytical Results
  - F-1 Complete Analytical Results
    - F-1-A Sampling Event # 1 (BP America, Inc. Sample # 1) – 9/11/99
    - F-1-B Sampling Event # 2 (BP America, Inc. Sample # 2) – 1/27/99
    - F-1-C Sampling Event # 3 (Norco Tank 409 Sample # 1) – 4/27/99
    - F-1-D Sampling Event # 4 (Norco Tank 409 Sample # 2) – 5/12/99
    - F-1 E Sampling Event # 5 (Stabilization – BP America, Inc. Samples # 3, 4, & 5 – 7/5-7/00)
  - F-2 Summary of Sampling Results
    - F-2-A Sampling Event # 1 (BP America, Inc. Sample # 1) – 9/11/99
    - F-2-B Sampling Event # 2 (BP America, Inc. Sample # 2) – 1/27/99
    - F-2-C Sampling Event # 3 (Norco Tank 409 Sample # 1) – 4/27/99
    - F-2-D Sampling Event # 4 (Norco Tank 409 Sample # 2) – 5/12/99
    - F-2-E Sampling Event # 5 (Stabilization – BP America, Inc. Samples # 3, 4, & 5 – 7/5-7/00)
- G Data Validation
  - G-1 Data Validation Report for Sampling Event # 1
  - G-2 Data Validation Report for Sampling Events # 2, 3, and 4
  - G-3 Data Validation Report for Sampling Event # 5

## **PETITION FOR EXCLUSION OF A HAZARDOUS WASTE PURSUANT TO LAC 33: I. 907 and LAC 33: V. 105 M**

### **Introduction**

This Petition has been prepared by Norco Refinery, Motiva Enterprises LLC, (Norco) pursuant to LAC 33: I. 907 and LAC 33: V. 105 (Appendix A) to delist residual solid material derived from thermal desorption recycling of oil-bearing residuals resulting from petroleum refining operations (hereinafter referred to as oily process material or OPM) at the Norco Refinery in Norco Louisiana. Philip Services Louisiana, Inc. (Philip) operates the Norco Oil Recovery Facility (NORF) at the Norco Refinery. The facility operates RCRA exempt based on the oil recovery exemptions contained in LAC 33: V. 105. D. 1. Prior to March 20, 1999, residual solids generated by the recycling process of listed hazardous wastes (LAC 33: V. 49 [Appendix A]) were handled as hazardous wastes carrying the hazardous waste codes from which the material was derived. After March 20, 1999, these oil-bearing residuals, when recycled for oil recovery at the NORF, are excluded from the definition of solid waste. However, the residual solids remaining after the oil has been recovered, are regulated as a listed waste (F037). These materials are handled as a hazardous waste.

Operation of the NORF benefits both pollution prevention and cost reduction. In recent years, the Norco Refinery has reduced the volume of waste to the point where the economic viability of the recycling activities was in economic jeopardy. In 1997 an agreement was reached with Philip to operate the NORF in partnership and make spare capacity available to other petroleum processors. Opening this recycling capability to additional petroleum processing clients has been the key to keeping the recycling and oil recovery capability available to Norco.

The State of Louisiana recognized this innovative arrangement in 1998 by awarding Norco the Governor's Environmental Leadership Award for Pollution Prevention. The NORF was noted for recovering over 1,000 tons/year of oil, while reducing hazardous waste generation within

the state of Louisiana by 3,100 tons/year.

Representatives held pre-Petition meetings with the Louisiana Department of Environmental Quality (LDEQ) on April 9, 1998 and September 8, 1998 from Norco and Philip. A Delisting Demonstration Sampling Program was prepared and copies of the Sampling and Analysis Plan and Quality Assurance Project Plan were sent to LDEQ in September 1998. Sampling events for the Delisting Demonstration were conducted on:

- September 11, 1998 – First Sampling Event;
- January 27, 1999 – Second Sampling Event;
- April 27, 1999 – Third Sampling Event;
- May 12, 1999 – Fourth Sampling Event; and
- July 5 – 7, 2000 – Fifth Sampling Event.

Philip personnel conducted all sampling. Pace Laboratories, Inc conducted analytical work. O'Brien & Gere Engineers, Inc validated all data.

After the first sampling event, which included analysis for a complete suite of Appendix IX analytes, the analytical requirements for sampling events 2, 3, and 4 were reduced to include:

- organics from Exhibit 4 "Constituents of Concern for Wastes from Petroleum Processes" from the Region 6 RCRA Delisting Program Guidance Manual for the Petitioner (March 24, 1996);
- Appendix IX metals; and
- selected conventional parameters.

All data were fully validated. The data indicate that thermal desorption recycling of oily process material is effective in reducing the levels of organic constituents to below levels of regulatory concern. After thermal desorption recycling of oily process material the levels of inorganic constituents were also below the levels of regulatory concern. Occasionally,

antimony may be present in selected batches of materials processed at the NORF.

To evaluate the potential to stabilize certain treated residual solids that may exhibit leachable antimony concentrations at elevated levels, a Stabilization Demonstration was designed and conducted as part of Sampling Event 5. A meeting was held with LDEQ on June 22, 2000 where a Sampling and Analysis Plan Addendum describing the Stabilization Demonstration was presented and discussed. The Stabilization Demonstration evaluated two potential stabilizing materials – hydrated lime and a proprietary fluid developed by Star Organics. To evaluate the stabilization process, residual solids that were not stabilized were evaluated for leachable metals (Appendix IX) after Toxicity Characteristic Leaching Procedure (TCLP) extraction. For comparison purposes, stabilized material from the same batch was extracted using the Multiple Extraction Leaching Procedure (MEP) following procedures outlined in SW-846 Method 1320, with the modification that only antimony and nickel were analyzed in leachate from subsequent extractions after the initial leachate was generated and analyzed.

Because the NORF processes oily process materials from more than one refinery, Motiva is requesting a Conditional Exclusion, whereby each batch of material processed through the NORF would be tested for selected organic and metal indicator parameters. Our pre-acceptance profiling program will identify material having concentrations of leachable antimony that, if not stabilized, may be above delisting levels and will allow us to stabilize material as required to meet the established delisting levels. If the material contains levels of analytes below the required delisting criteria, the material would be handled under Subtitle D requirements. If the material contains levels of analytes above the required delisting criteria, the material would be handled under Subtitle C requirements (including stabilization with cement).

To assist in the review of this proposed action, the format of this petition has been structured to follow the "Outline for Delisting Petitions" contained in Appendix A of Region 6 RCRA Delisting Program Guidance Manual for the Petitioner (March, 2000). This outline (with

appropriate cross-references to this Delisting Petition) is included in Appendix B.

Conditions and criteria for two previously approved relevant Delisting Petitions are included in  
✓ Appendix C. Suggested regulatory language and conditional exclusion conditions are included  
in Appendix D. ✓

## **Section A: ADMINISTRATIVE INFORMATION**

### **A.1 PETITIONER'S NAME AND ADDRESS [LAC 33: I. 907 C.1]**

Norco Refinery, Motiva Enterprises LLC  
15536 River Road  
Norco, Louisiana 70079

### **A.2 PEOPLE TO CONTACT FOR ADDITIONAL INFORMATION PERTAINING TO THIS PETITION**

Mr. Fred Goodson, Delisting Project Manager  
Norco Refinery, Motiva Enterprises LLC  
15536 River Road  
Norco, Louisiana 70079  
Telephone # 504-465-7609

Mr. Steve Bone, Thermal Desorption Project Manager  
Philip Services Corp.  
268 Power Boulevard  
Reserve, Louisiana 70084  
Telephone # 504-465-6913 (at Norco Office)  
Telephone # 504-536-4656 (at Reserve Office)

Dr. James Pinta Jr., Ph.D., P.G., Delisting Demonstration QA Manager  
Apex Environmental, Inc.  
101 Bradford Road, Suite 200  
Wexford, Pennsylvania 15090  
Telephone # 724-935-6999

**A.3 FACILITY RESPONSIBLE FOR GENERATING PETITIONED WASTE AND LOCATION OF THE PETITIONED WASTE [LAC 33: V. 105 M. 7. d]**

The facility responsible for generating the petitioned waste is the NORF located at the Norco Refinery. The petitioned waste is generated as a result of thermal desorption recycling of oily process materials at the NORF. The Norco Refinery is located in Norco, Louisiana at coordinates 90 degrees, 24 minutes, and 30 seconds latitude and 30 degrees, 0 minutes, and 30 seconds longitude in St. Charles Parish (Sections 6 & 21, Township 12S Range 8E). The Norco facility is located in St. Charles Parish, on the east bank of the Mississippi River, about 25 miles upriver from New Orleans, Louisiana.

Figure 1 presents the site location of the Norco Refinery. Figure 2 presents a layout or plot plan of the Norco Refinery indicating the location of the NORF. Mailing information and Resource Conservation and Recovery Act (RCRA) identification number for the Norco Refinery is:

Norco Refinery, Motiva Enterprises LLC  
15536 River Road  
Norco, Louisiana 70079  
EPA ID. No. LAD008186579

**A.4 DESCRIPTION OF THE PROPOSED DELISTING ACTION [LAC 33. I. C. 4]**

Norco Refinery. Motiva Enterprises LLC (Norco) is petitioning the LDEQ to exclude from hazardous regulation (delist), the residual solids generated at the NORF located at the Norco Refinery in Norco, Louisiana. These residual solids are generated as the result of thermal desorption recycling of oily process materials from petroleum exploration, production, refining (Figures 3, 4, and 5), and associated transportation processes and operations.

Prior to March 20, 1999, Norco's residual solids result from oil recycling and thermal desorption treatment of oily process materials identified as EPA hazardous waste as follows:

- D001 flammable, ignitable materials;
- D002 corrosive materials;
- D003 reactive solids;
- D007 characteristic wastes containing chromium;
- D008 characteristic wastes containing lead;
- D018 characteristic wastes containing benzene;
- F037 primary sludge from the gravitational separation of oil/water/solids;
- F038 secondary sludge from the gravitational separation of oil/water/solids;
- K048 dissolved air flotation (DAF) sludge;
- K049 slop oil emulsion solids;
- K050 solids generated from cleaning of heat exchanger bundles;
- K051 API separator sludge;
- K052 leaded tank bottom corrosion solids;
- K169 crude oil storage tank sediment from refining operations;
- K170 clarified slurry oil storage tank sediment and/or in-line filter/separation solids from petroleum operations;
- K171 spent hydrotreating catalyst from petroleum refining operations; and
- K172 spent hydrorefining catalyst from refining operations.

Prior to March 20, 1999, residual solids generated by the recycling process of listed hazardous wastes (LAC 33: V. 49 [Appendix A]) were handled as hazardous wastes, based on the fact that they were derived from the listed wastes and, therefore carried the same listing as the material from which it was derived.

After March 20, 1999, oily process materials, when recycled for oil recovery at the NORF, are excluded from the definition of solid waste. However, the residual solids remaining after the oil has been recovered, are regulated as a listed waste (F037). These materials are handled as a hazardous waste.

The LDEQ has adopted regulations under the Hazardous and Solid Waste Amendments of 1984 (HSWA) to restrict the land disposal of such oily process material. As a result of these

regulations, all hazardous oily process material to be placed on the land must meet treatment standards based upon the performance of the Best Demonstrated Available Technology (BDAT) identified for individual EPA hazardous waste number classifications. Oily process material identified as EPA hazardous waste numbers K048 through K052 became LDR regulated on 08 November 1990 (55 FR 22520). Subsequently, oily process material identified as EPA hazardous waste numbers F037 and F038 became LDR regulated on 30 June 1992 (57 FR 37194). Oily process material identified as EPA hazardous waste numbers K169 through K172 became LDR regulated on 06 August, 1998 (63 FR 42110). In addition, the recently promulgated final rule entitled, *Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Petroleum Refining Process Wastes; Land Disposal Restrictions for Newly Identified Wastes; and CERCLA Hazardous Substance Designation and Reportable Quantities* (63 FR 42110) provides an alternative for management of oily process materials during normal petroleum refining operations. This rule revises 40 CFR 261.4 (a)(12) to provide that oily process materials from petroleum refinery sources that are inserted into the petroleum refining process (including the coker) along with other process streams are excluded from the definition of solid waste. These materials are exempt from the definition of solid waste and transportation and storage of these materials are not subject to RCRA regulations, including Subtitle C management standards. The exclusion also applies to oily process materials undergoing reclamation/recycling (e.g., oil recovery) prior to being returned to the petroleum refining process. The exclusion (adopted by Louisiana on March 20, 1999) applies to oily process materials that are generated off-site, including qualifying materials transported intra- or inter-company from off-site refineries. However, any residual solids resulting from practices subject to the exemption, if discarded, would be considered a newly generated listed hazardous waste (F037) subject to RCRA regulation, including Subtitle C management requirements. (what?)

Land Disposal Restrictions (LDR) for EPA hazardous waste number F037 (57 FR 37194) currently limit disposal options available to Norco. Since oily process material is primarily comprised of oil/water/solids, available disposal options prior to the promulgation of LDRs

were: land treatment, volume reduction followed by land disposal, and application of a treatment technology followed by land disposal.

Norco proposes and hereby petitions, that the residual solids resulting from thermal desorption recycling of oily process material at the NORF, be excluded from regulation as a hazardous waste pursuant to LAC 33: I. 907 and LAC 33: V. 105 M. This proposed exclusion will apply to residual solids resulting from thermal desorption recycling of oily process materials derived from various sources and treated at the NORF located at the Norco Refinery in Norco, Louisiana having the F037 waste code.

Norco requests the LDEQ to utilize appropriate and available modeling approaches, including the modified EPA Composite Model for Landfills (56 FR 32993, July 18, 1991 and 56 FR 67197, 30 December 1991), to develop representative delisting criteria during consideration of their proposed action. Given the limited quantity of residual solids generated, and the technical merit of Norco's recycling program, Norco's proposed action is both appropriate and warranted. In addition, previously approved exclusion of similar materials has been granted at both the Federal and State level (Appendix C).



Norco's suggested regulatory language and conditional exclusion conditions are included in Appendix D. Suggested regulatory language would include the following waste description:

Residual solids generated at a maximum annual rate of up to 8,000 cubic yards (6,000 tons) per year from thermal desorption recycling of oily process material that after recycling operations and thermal desorption are newly generated F037 wastes. This exclusion applies only to residual solids, resulting from thermal desorption recycling of oily process material treated at the Norco Oil Recovery Facility (NORF) in Norco, Louisiana refinery. This exclusion was published on *(date of final promulgation)*.

Norco acknowledges that this proposed action will be specific with respect to residual solids generated at the NORF located at the Norco Refinery at Louisiana and the conditions represented within their Delisting Demonstration, and contingent upon the residual solids

generated during operation complying with conditional exclusion criteria to be designated by the LDEQ. Norco's suggested conditional exclusion criteria are included in Appendix D.

**A.5 STATEMENT OF PETITIONER'S INTEREST IN THE PROPOSED ACTION  
[LAC 33:1907 C. 2]**

Operation of the NORF benefits both pollution prevention and cost reduction. Residual solids from this oil recovery process have been processed to assure the absence of hazardous waste characteristics and applicable LDR treatment standards. Once delisted, this material can be managed at Subtitle D facilities. This will reduce transportation and disposal costs currently incurred to manage the material at Subtitle C (hazardous waste) landfills. Hence, the benefit is pollution prevention, reduced cost, reduced transportation, and improved economic viability to assure continuation of the oil recovery operation at Motiva.

Operation of the NORF has benefited Motiva by reducing the amount or volume and toxicity of oily process materials, as well as recovering the oil for feedstock to the refinery. It has minimized the need for off-site transportation and landfill/incineration of hazardous waste. In recent years, the refinery waste streams were reduced to the point where the oil recovery facility was in economic jeopardy. However, in 1997, an agreement was reached with Philip to operate the facility in partnership with Motiva and to make spare capacity available to other petroleum processors. This has been the key to keeping the oil recovery capability available to Motiva, and expanding its capability to other processors who may have otherwise disposed of their material instead of recycling their oily process material and minimizing waste generation.

The State of Louisiana recently recognized this innovative arrangement. Motiva (as Norco) is a recipient of a 1998 Governor's Environmental Leadership Award for Pollution Prevention. The NORF was noted as recovering over 1,000 tons/year of oil, while reducing hazardous

waste generation within the State of Louisiana by 3,100 tons/year.

Motiva seeks to delist material processed through the recycling unit at an anticipated rate of up to 8,000 cubic yards/year (6,000 tons/year). When delisted, Motiva will manage the residual solids as nonhazardous wastes within the State of Louisiana at a qualified Subtitle D facility. Motiva will also consider alternative disposal and recycling options to be implemented in compliance with LDEQ regulations.

Norco is interested in improving the economic viability of the NORF to:

- increase pollution prevention in Louisiana;
- increase waste minimization in Louisiana;
- increase recycling activities in Louisiana; and
- maintain the capability at the Norco Refinery.

#### **A.6 STATEMENT OF THE NEED AND JUSTIFICATION FOR THE PROPOSED ACTION, INCLUDING SUPPORTING TESTING, STUDIES AND OTHER INFORMATION [LAC 33: 1 907 C. 3]**

Thermal desorption recycling of Norco's oily process material, combined with delisting, will:

- provide removal/reduction of hazardous constituents of concern to concentrations below levels of regulatory concern;
- eliminate Norco's dependence on Subtitle C management requirements for land disposal of hazardous residual solids;
- increase the number of acceptable disposal/reuse options available to Norco, since the delisted residual solids will be regulated as nonhazardous; and
- assure economic viability of the NORF by offering the processing capability of the unit to an expanded base of outside customers so that pollution prevention, waste minimization, and cost reduction can continue.

Justification for Norco's contention is that thermal desorption units operate on the basic principles of temperature and residence time, combined with an inert processing atmosphere to prevent the potential formation of toxic by-products of combustion. Norco further contends that the thermal desorption unit demonstrated at the NORF is capable of complying with established delisting criteria at the NORF's standard operating conditions.

Operation of the NORF benefits both pollution prevention and cost reduction. Residual solids from this oil recovery process have been processed to assure the absence of hazardous waste characteristics. Once delisted, this material can be managed at Subtitle D facilities. This will reduce transportation and disposal costs currently incurred to manage the material at Subtitle C (hazardous waste) landfills. Hence, the benefit is pollution prevention, reduced cost, reduced transportation, and improved economic viability to assure continuation of the oil recovery operation at Norco.

Operation of the NORF has benefited Norco by reducing the amount and toxicity of oily wastes, as well as recovering the oil for feedstock to the refinery. It has minimized the need for off-site transportation and landfill/incineration of hazardous waste. In recent years, the refinery waste streams were reduced to the point where the oil recovery facility was in economic jeopardy. However, in 1997, an agreement was reached with Philip to operate the facility in partnership with Norco and to make spare capacity available to other petroleum processors. This has been the key to keeping the oil recovery capability available to Norco.

The State of Louisiana recently recognized this innovative arrangement. Norco is a recipient of a 1998 Governor's Environmental Leadership Award for Pollution Prevention. The NORF was noted as recovering over 1,000 tons/year of oil, while reducing hazardous waste generation within the state of Louisiana by 3,100 tons/year.

Norco's request is further justified by the previously approved final conditional exclusion granted to Marathon's Texas Refining Division (TRD) facility located in Texas City, Texas

(Appendix C-1) and Marathon's Louisiana Refining Division (LRD) facility in Garyville, Louisiana (Appendix C-2).

Both the TRD's and LRD's final delistings are based on utilizing thermal desorption technology.

Norco is petitioning the LDEQ to exclude (delist) from hazardous waste regulation, LAC 33:V.4901 (Appendix A), residual solids resulting from the thermal desorption recycling of oily process material (F037), processed through the NORF at the Norco Refinery located in Norco, Louisiana.

Thermal desorption provides removal of volatile and semivolatile constituents utilizing an indirect heat source, rather than direct contact heat that involves oxidation and potential formation of toxic organic by-products. The use of an indirect heat source, combined with an inert processing atmosphere, assures that thermal desorption will provide effective removal of volatile and semivolatile constituents without potential formation of toxic by-products of incomplete combustion.

The delisting of the NORF's residual solids will enable Norco to recycle recoverable oil and virtually eliminate their dependence on land disposal of hazardous waste. Norco's program is concurrent with congressionally mandated actions to promote volume reduction, toxicity minimization, and recycling. Furthermore, recycling utilizing thermal desorption provides Norco a waste management option that is equivalent to BDAT, as defined within LDRs specific to oil/water/solids separation of oily process material from petroleum refining processes.

To support this proposed action, Norco conducted a Delisting Demonstration and subsequent testing program. Sampling and testing methodologies utilized during Norco's Delisting Demonstration are referenced in Section E. Complete descriptions of sampling methodology, preservation techniques, quality assurance/quality control, analytical requirements, and

program organization for Norco's Delisting Demonstration, are contained within Appendix E.

Oily process material solids (thermal desorption recycling feed) were collected from the inspection hatch on the thermal desorption unit. This material represents the true feed to the dryer and is in the form of a centrifuge cake after being dewatered.

Residual solids (thermal desorption recycling product) have the physical properties of a fine particulate dust resulting from thermal drying above 1400°F. Samples of the residual solids were collected directly from the exit of the thermal desorption process as the material is dropped from the cooling screw. To prevent dusting of the material, prior to dropping from the cooling screw the material is wetted using plant water and a polymer (DC-430 manufactured by Par-a-sol Chemicals, Inc., Baton Rouge, La.). Representative samples of the NORF's residual solids were obtained by:

- collecting a single grab sample to analyze for volatiles; and
- compositing three (3) grab samples directly from the discharge of the cooling chamber assembly.

The sampling schedule utilized during Norco's Delisting Demonstration and subsequent Stabilization Demonstration, including designated analytical requirements, is summarized in Table 1.

A plot plan of the NORF is presented in Figure 6. Simplified process flow diagrams of the NORF are included as Figures 7, 8, and 9. A complete description of the NORF thermal desorption system is provided in Section C-3.

Norco's Delisting Demonstration documented that the residual solids resulting from recycling of Norco's oily process material by thermal desorption contained only a few detectable organic constituents of concern, i.e., relevant to oily process material generated from petroleum refining processes, at concentrations detectable using the established analytical reporting limits. The

presence of these organic constituents of concern, at concentrations below levels of regulatory concern, does not warrant management of residual solids generated from oil recycling of listed hazardous wastes at the NORF as a hazardous waste. Analytical results, obtained during Norco's Delisting Demonstration for constituents of concern, are included in Appendix E. All data have been validated (Appendix G).

Analytical results of the Toxicity Characteristic Leaching Procedure (TCLP) conducted on both grab and composite samples of Norco's residual solids during Norco's Initial Delisting Demonstration, documented that all detected inorganic constituents of concern, i.e., relevant to wastes generated from petroleum refining processes, were present at concentrations below levels of regulatory concern. Analytical results of TCLP extractions conducted during Norco's Initial Delisting Demonstration, are summarized in Table 2. However, antimony was observed at elevated levels in leachate from samples derived from recycling material from BP America, Inc.

Therefore, analyses conducted as part of the initial four sampling events demonstrate the thermal desorption recycling operation at Norco effectively utilizes oily process material to recover and recycle petroleum feedstock back to the refinery while rendering the residual solids nonhazardous (Table 2). However, samples from BP America, Inc. exhibit levels of antimony in leachate from TCLP that may be above anticipated delisting criteria. Motiva conducted a Stabilization Demonstration to demonstrate that samples such as these can be stabilized so that they are not only nonhazardous, but also meet anticipated delisting levels. Sampling and testing methodologies utilized during Norco's Stabilization Demonstration are referenced in Section E. Complete descriptions of sampling methodology, preservation techniques, quality assurance/quality control, analytical requirements, and program organization for Norco's Stabilization Demonstration, are contained within Appendix E.

The Stabilization Demonstration consisted of evaluation of three potential procedures using two different stabilizing materials:

- application of hydrated lime (50 pounds per ton feed) to OPM feed material at the live bottom;
- application of Star Organics SPF (0.5 gpm) to OPM at the feed auger; and
- application of Star Organics SPF (0.5 gpm) to residual solids at the cooling screw.

Figure 10 indicates locations of stabilizing material application. Samples to characterize recycled material that was not stabilized, and recycled and stabilized material included:

- three grab samples of treated, but not stabilized, residual solids collected for compositing and analysis for Appendix IX list metals after extraction using the TCLP; and
- three grab samples of treated and stabilized residual solids collected for compositing. This sample was extracted using the MEP. The initial extract was analyzed for Appendix IX metals, with subsequent extracts (extracts 2 through 9 and higher) being analyzed for antimony and nickel.

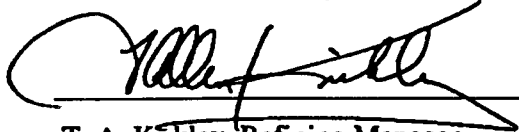
All procedures used followed the approved SAP, SAP Addendum, and QAPP. All data were validated.

The results (Table 3) indicate that hydrate lime applied to the live bottom at a minimum rate of 50 pounds per ton of feed material can effectively stabilize the residual solid material so that not only is the residual solid product nonhazardous and the levels of constituents for which the material was initially listed are below levels of regulatory concern, but the levels of all constituents, including antimony, are below levels of anticipated delisting criteria.

**A. 7                    SIGNED CERTIFICATION STATEMENT [LAC 33: V. 105 M. 7. I]**

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for getting the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

**NORCO REFINING, MOTIVA ENTERPRISES, LLC**

  
\_\_\_\_\_  
T. A. Kirkley, Refining Manager

10/30/00  
\_\_\_\_\_  
Date

## **Section B. WASTE AND WASTE MANAGEMENT HISTORY INFORMATION**

### **B-1 BASIS FOR THE WASTE LISTING, PHYSICAL FORM OF THE PETITIONED WASTE, and TYPICAL RANGE IN PERCENT SOLIDS [LAC 33: V. 105 M. 7. f]**

Wastes represented within Norco's Delisting Demonstration included oily process material generated from oil/water/solids separation of process wastewater and emulsions from petroleum refining processes (F037).

The physical form and range of percent solids typically processed by the NORF is summarized in Table 4.

Residual solids represented within Norco's Delisting Demonstration, utilized to support Norco's proposed action, are the residual solids resulting from the recycling of oily process material by thermal desorption of listed hazardous wastes through the NORF. Analytical results for the NORF's residual solids, represented within Norco's Delisting Demonstration, are presented and summarized in Appendix F.

Norco's Delisting Demonstration did not provide separate representation of all potential feed locations. However, Norco's thermal desorption recycling system operates a materials handling program that controls the feed rate of oily process material solids being recycled. ?

It is Norco's contention that oily process materials, generated from oil/water/solids separation of wastewater from petroleum refining processes, represent a consistent process feed for oil recycling and the residual solids generated by the thermal desorption system are consistent in nature. Petroleum refining oily process material has been characterized extensively since the establishment of the "Skinner List", i.e., constituents of concern for petroleum refining wastes.

Furthermore, the EPA has contended, i.e., in the original listing of F037 and F038 wastes (55 FR 46354, 02 November 1990) and in final LDR rulemaking for F037 and F038 wastes (57 FR 37194, 30 June 1992), that petroleum-refining wastes (K048 through K052, F037 and F038) are identical relative to constituents of concern. The EPA, in promulgating the final rule entitled, *Hazardous Waste Management System: Identification and Listing of Hazardous Waste: Petroleum Refining Process Wastes: Land Disposal Restrictions for Newly Identified Wastes: and CERCLA Hazardous Substance Designation and Reportable Quantities* (63 FR 42110 – revising 40 CFR 261.4 (a)(12)) and LDEQ, in promulgating an identical exclusion (September 20, 1999) excludes oily process material undergoing reclamation/recycling (e.g., oil recovery) prior to being returned to the petroleum refining process from the definition of solid waste, and, because of their uniformity, designates residual solids as a single, newly generated, listed hazardous waste F037, regardless of their point of generation.

Therefore, Norco contends that oily process material generated from the petroleum refining processes, i.e., material that would be K048; K049; K050; K051, K169, K170, K171, K172, F037 and F038 if not recycled, and instead disposed, represent a consistent and predictable source of oil for recycling and can be treated at the NORF to achieve concentrations of constituents of concern below levels of regulatory concern and anticipated levels of delisting criteria.

## **B-2 HISTORY OF WASTE GENERATION**

In 1916 the New Orleans Refining Company purchased 366 acres of cane fields from the Good Hope Plantation to establish a marine petroleum supply terminal. On May 8, 1920, the first process unit began operation. The community near the refinery grew along with the growth experienced by the refinery and adopted the initials of the company – New Orleans Refining Company – Norco as the name of the town. Shell Petroleum Corporation, a forerunner of Shell

Oil Company, acquired the refinery in 1929. By 1955, when a chemical plant was added, the refinery was processing up to 75,000 barrels per day. Olefins production units were added in the 1970s and 1980s, providing the capability to produce basic building blocks for downstream petrochemical manufacturing processes. The Norco East Site location thus became a fully integrated and co-located refinery and petrochemical plant. In April 1996, the refining assets were given a separate business identification when the Shell Norco Refining Company (SNRC) was formed. As a result, the Norco East Site was divided into two business entities, the Shell Norco Refining Company and the Norco Chemical Plant. In October 1998, Motiva Enterprises LLC was formed (an alliance between Shell, Texaco and Saudi Aramco), and SNRC became Norco Refining. The co-located Shell Norco Chemical Plant - East Site is operated by Shell Chemical. The facility continues to be an integrated petrochemical facility, sharing wastewater treatment, oil recovery, utilities, and various logistical entities.

Today, the Norco facility occupies about 1,000 acres (including both the East and West Sites) and takes in about 220,000 barrels a day of crude oil and about another 80,000 barrels a day of other feedstocks and processes them into a variety of products and intermediate chemical products, including:

- Automotive gasoline;
- Furnace oil;
- Industrial fuel oil;
- Jet fuel;
- Petroleum coke; and
- Building block chemical intermediates such as calcium chloride, methyl ethyl ketone, olefins, ethylene, propylene, epoxy resins, and butadiene used for the manufacture of antifreeze, tires, plastic food containers, trash bags, laundry detergent, furniture, tennis shoes, and other consumer and industrial products.

The NORF markets its services to area refinery and petroleum operations to maintain the economic viability of oil recycling, waste minimization, and pollution prevention. Residual material derived from oily process materials that are listed hazardous wastes is shipped to either

one of Chemical Waste Management's facilities, located in Carlyss, Louisiana or Emelle, Alabama, or Waste Control Specialists, LLC, located in Andrews, Texas.

### **B-3 ESTIMATE OF AVERAGE QUANTITIES AND VOLUME OF RESIDUAL SOLIDS [LAC 33: V. 105 M.7.f]**

The amount of variability inherent in the NORF's recycling operation is minimal, since the majority of the NORF's residual solids is comprised of oily process material resulting from the primary treatment of process wastewater. However, the amount of material processed monthly will be variable. Average annual generation rates for the NORF's residual solids have ranged between 250 to 425 tons per month or 2,800 to 5,000 tons per year.

However, Norco anticipates that potential exists for higher residual solids generation rates as market forces create opportunities for the thermal desorption recycling system (including periodic bundle cleaning and process sump clean-out events, etc.). Therefore, Norco requests that the LDEQ utilize maximum residual solids generation rates of 1,000 cubic yards (750 tons) per month and 8,000 cubic yards (6,000 tons) per year, respectively to develop delisting criteria.

### **B-4 HISTORY OF WASTE MANAGEMENT**

Oil recovery operations utilizing centrifuge and thermal desorption have been utilized at Norco since 1993. The NORF has operated at the Norco Refinery since March 1994. During this time, the residual solids generated by the NORF carried codes F037, F038, and/or K048 thru



K052, and/or K169 thru K172, depending on the listings that applied to the NORF feedstock. Since March 1999, however, the residual solid material is listed as F037.

The NORF has provided recycling services to a variety of clients throughout the region served. Clients served are listed in Table 5.

Residual solid material generated from the NORF is containerized in "rolloff" containers approved by DOT for truck transport to landfill facilities. The residual solid material is stored in the containers to await analytical results to meet land disposal requirements. If the material requires stabilization due to the presence of leachable metals, stabilization is accomplished at the landfill facility prior to burial of the material. Landfill facilities that are used to dispose of the residual solid material are RCRA-permitted hazardous waste landfills. The landfills are:

1. Chemical Waste Management, Inc. Emelle Facility  
Alabama Hwy. 17 at Mile Marker 163  
Emelle, AL 35459
2. Chemical Waste Management, Inc. Carlyss Facility  
7170 John Brannon Road  
Carlyss, LA 70665
3. Waste Control Specialists, LLC  
9998 W. Hwy. 176  
Andrews, TX 79714

When delisted, Motiva will manage the residual solids as nonhazardous wastes within the State of Louisiana at a qualified Subtitle D facility. Motiva will also consider alternative disposal and recycling options to be implemented in compliance with LDEQ regulations within the state of Louisiana.

## **Section C: PROCESS AND WASTE MANAGEMENT INFORMATION**

### **C-1 GENERAL OPERATIONS AT THE GENERATING FACILITY**

Norco Refining (SIC 2911) and co-located Shell Norco Chemical Plant – East Site (SIC 2869) take in about 220,000 barrels a day of crude oil and about another 80,000 barrels a day of other feedstocks and processes them into a variety of products and intermediate chemical products, including:

#### Norco Refining

- Automotive gasoline;
- Furnace oil;
- Industrial fuel oil;
- Jet fuel;
- Petroleum coke;
- Sulfur; and

#### Shell Norco Chemical Plant – East Site

**C-2 CONTRIBUTING MANUFACTURING PROCESSES, PROCESS MATERIALS, AND WASTE TREATMENT PROCESSES AND AN ASSESSMENT OF WHETHER SUCH PROCESSES, OPERATIONS OR FEED MATERIALS CAN OR MIGHT PRODUCE A WASTE NOT REPRESENTATIVE OF THE DEMONSTRATION [LAC 33: V. 105 M. 7. e]**

The generating unit for Norco's residual solids is the Philip thermal desorption unit. The source for Norco's oily process material feedstocks includes the wastewater treatment systems and other processing and storage facilities serving the petroleum industry in the area, including the Norco Refinery, BP America, Inc, Motiva Enterprises, LLC (Convent Refinery), Orion Refining Co., Shell Chemical, and other area refineries and petroleum operations (Table 5).

A list of hazardous wastes generated at the Norco Refinery is given in Table 6, which gives the respective hazardous waste codes and descriptions. A list of non-hazardous wastes is given in Table 7, which gives the Louisiana DEQ description and number. Oily process materials that otherwise carry listings for refinery wastes (such as slop oil emulsions and API separator solids), when they are recycled for oil recovery at the NORF, are excluded from the definition of solid waste. However, the residual solids remaining after the oil has been recovered is regulated as F037 listed hazardous waste.

Waste treatment and waste management units at the Norco Refinery are summarized in Table 8 and their locations are indicated in Figure 11.

The following sections contain descriptions for industrial processes within the petroleum refining industry, and the recycling process represented within Norco's Delisting Demonstration. Additionally, this section contains an assessment of the inherent variability within Norco's Delisting Demonstration.

## **C-2.1 General Description of Petroleum Refining Process**

A petroleum refinery is a complex of integrated processing units designed to convert crude oil into a wide variety of marketable products (Figure 3). Products manufactured as a result of this processing include: gasoline, jet fuel, kerosene, butane, propane, diesel fuel, fuel oils, lubricating oils, waxes, asphalt, coke, and petrochemical feedstocks. Petrochemical feedstocks, in turn, form the basic ingredients for a number of other products, e.g., plastics, pharmaceuticals, cosmetics, synthetic rubber, adhesives, fibers, polishes, paints, explosives, pesticides, and fertilizers.

Most refineries are located either near a large supply of crude oil or near a large market area. Regardless, they will always be located near an adequate supply of water, which is required during processing. A refinery is a carefully designed, organized, and coordinated arrangement of physical and chemical manufacturing processes. In general, a refinery can be divided into two important areas: (1) a storage area and (2) a processing area. The storage area holds both crude oil as it arrives at the refinery and petroleum products resulting from the refining process. The processing area is where crude oil is physically and chemically altered by a number of processes, including: (1) distillation, (2) treating, (3) reforming, (4) cracking, (5) coking, (6) polymerization, (7) alkylation, (8) hydrogen processing, (9) isomerization, (10) hydrotreating and hydroprocessing, and (11) blending. Each process is designed to change less useful fractions (or parts) of the petroleum into more marketable ones. In addition, a refinery has special supporting facilities, such as a steam generating plant, wastewater treatment, service, and maintenance facilities.

Crude oils have a composition that generally consist of:

- 83 to 86 weight percent carbon;
- 11 to 14 weight percent hydrogen;

- Small amounts of sulfur (up to 5 percent), nitrogen (up to 1 percent), oxygen (up to 5 percent), and metals (up to 0.1 percent).

Although crude oil is a mixture of hundreds of different hydrocarbons, each group has its own boiling range (shown below). This facilitates the separation of crude oil into its various fractions. This is the basis of the initial refining process where crude oil is fractionated (separated) into various major component groupings of raw gasoline, kerosene, diesel fuel, fuel oil, and asphalt.

Metals present in crude are principally iron, nickel, and vanadium. Most of these nonhydrocarbon constituents are chemically combined with carbon and hydrogen and are impurities that must be removed during the refining process. Sulfur compounds are generally distributed throughout the crude, although they tend to concentrate in the higher boiling fractions. Most nitrogen and oxygen compounds boil above 400°F. Most metals fractionate into the heavy industrial fuel and asphalt fractions.

Refining operations typically involve the following process categories: storage, separation, processing, and blending.

**Storage** – Crude petroleum and its products are most commonly stored in steel tanks, either under atmospheric conditions or under pressure, depending upon the boiling point of the material stored.

**Separation** - Separation operations include:

- Distillation (separation of hydrocarbons using differences in boiling points of the various products). Distillation is the initial process used to separate various hydrocarbons, contained in crude oil into fractions having a similar boiling range. This occurs in specially designed fractionating columns. The process results in the separation of crude oil into fractions that can either be marketed or converted by further processing into other more marketable products.

<u>Marketable Product</u>	<u>Boiling Range</u>
Gasoline	100°-400°F
Jet Fuel and Kerosene	400°-500°F
Diesel Oil	400°-650°F
Gas Oil	650°-800°F
Residuals	850°F+

- Gravity Separation (separation of two immiscible materials of different densities by the effects of gravity, either naturally or mechanically produced).
- Extraction (removal of a compound from a mixture by contacting the mixture with an immiscible solvent in which the compound is more soluble than it is in the mixture).
- Absorption/Adsorption (removal of a compound from a mixture by means of its physical attraction to another immiscible liquid or solid).
- Chemical Reaction (removal of a compound from a mixture reaction with another compound that is bound in another material).

**Processing** – Crude oil is typically heated to a temperature of approximately 800°F and distilled in a fractionating column into its various component fractions. Once fractionated, its components are further converted, treated, or blended using a series of specialized refining processes (described below). Each of these processes converts the less valuable fractions into more useful ones.

Typical processing operations include:

- Treating – Treating is used to remove undesirable contaminants, such as sulfur, oxygen, nitrogen, metals, and unstable hydrocarbons from refinery products to meet manufacturing specifications. Treating can be a chemical or a physical process. Typical treatment processes include:
  - Desalting – Used to remove salt and water from crude oil. To do this, an emulsion breaker is added. Crude oil is thoroughly mixed with water to dissolve the salt. Chemical and electrical methods break the resulting emulsion.

- Dehydration – Used to remove water from refinery products. To do this, distillation and dehydrator vessels use clay-type absorbents.
- Chemical Treating - Used to remove or change the undesirable properties associated with sulfur, nitrogen or oxygen compound contaminants in petroleum products by either extraction or oxidation (also known as sweetening), depending upon the product. Extraction is used to remove sulfur from the very light petroleum fractions, such as propane/propylene and butane/butylene. Sweetening is more effective on gasoline and middle distillate products.
- Solvent Extraction – Used to dissolve one part of the crude oil fraction from another, such as in treating heavier distillate oils to remove or separate lubricating oils, waxes, etc. This is done using chemical solvents.
- Reforming – Reforming converts the low octane gasoline generated in the crude distillation units into high-octane gasoline. Reforming typically uses lead- and platinum-type catalysts in the presence of hydrogen. Some reformers are used to convert low octane gasoline into petrochemical feedstocks, such as benzene and toluene.
- Cracking – Cracking converts heavy hydrocarbons into lighter ones. There are two basic types of cracking: (1) thermal cracking using heat and pressure, and (2) catalytic cracking using a catalyst, heat and pressure. This process produces a high-octane gasoline. Catalytic cracking is the more commonly used process. Most catalysts used in catalytic cracking consist of mixtures of crystalline synthetic silica-alumina, termed "zeolites," and amorphous synthetic silica alumina. The catalytic cracking processes, as well as most other refinery catalytic -processes, produce coke that collects on the catalyst surface and diminishes its catalytic properties. The catalyst, therefore, needs to be regenerated continuously or periodically essentially by burning the coke off the catalyst at high temperatures.
- Coking – A type of cracking process used to reduce production of low-value residual fuels to either transportation fuels (i.e., gasoline and diesel) or solid carbon-based material for graphite products (i.e., furnace electrodes). The light hydrocarbons are boiled off first (and either recovered for beneficial reuse or treated) and the heavy hydrocarbons are heated until they carbonize into solid coke.
- Polymerization – Polymerization is the process that is almost the opposite of cracking. It uses a catalyst and pressure to combine lighter hydrocarbons to produce a higher-octane gasoline blend. The catalyst used is a chemically coated solid.
- Alkylation – Alkylation is a process that also combines lighter hydrocarbons by using a catalyst to produce high-octane gasoline. Different hydrocarbons are used as feedstocks

for alkylation than those used for polymerization. The catalyst used is typically a liquid chemical.

- **Hydrogen Processing** - Crude oil fractions are processed in the presence of hydrogen, almost always with a solid metal-containing a catalyst to either convert the crude fractions into more valuable products or to remove contaminants. Hydrogen processing includes: hydrocracking, catalytic hydrocracking, hydrogen sulfurization, isomerization, and selected hydrogenation.
- **Isomerization**- Isomerization is used to alter the arrangement of a molecule without adding or removing anything from the original molecule. Typically, paraffins (butane or pentane from the crude distillation unit) are converted to isoparaffins having a much higher octane. Isomerization reactions take place at temperatures in the range of 200 to 400 degrees F in the presence of a catalyst that usually consists of platinum on a base material.
- **Hydrotreating and Hydroprocessing** - Hydrotreating and hydroprocessing are similar processes used to remove impurities such as sulfur, nitrogen, oxygen, halides and trace metal impurities that may deactivate process catalysts. Hydrotreating also upgrades the quality of fractions by converting olefins and diolefins to paraffins for the purpose of reducing gum formation in fuels. Hydroprocessing, which typically uses residuals from the crude distillation units, also cracks these heavier molecules to lighter more saleable products. Both hydrotreating and hydroprocessing units are usually placed upstream of those processes in which sulfur and nitrogen could have adverse effects on the catalyst, such as catalytic reforming and hydrocracking units.
- **Blending** - Blending is the final step in the production of finished petroleum products to meet quality specifications and market demands. A large volume operation may include the blending of various gasoline stocks, including alkylates. The blending operation can be accomplished by blending individual components in a single tank or by mixing the components in a piping system.

## **C-2.2 Wastewater Treatment**

The petroleum refining industry uses relatively large volumes of water. Four types of wastewater are produced: surface water runoff, cooling water, process water, and sanitary wastewater.

Surface water runoff is intermittent and may contain constituents from spills to the surface, leaks in equipment and any materials that may have collected in drains. Surface water runoff typically also includes water coming from crude and product storage tank roof drains.

A large portion of water used in petroleum refining is used for cooling. Cooling water typically does not come into direct contact with process oil streams and therefore contains less contaminants than process wastewater. Most cooling water is recycled over and over with a bleed or blowdown stream to the wastewater treatment unit to control the concentration of contaminants and the solids content in the water. Cooling towers within the recycle loop cool the water using ambient air. Historically, water used for cooling often contained chemical additives, such as chromates, phosphates, and antifouling biocides to prevent scaling of pipes and biological growth. However, many refineries no longer use chromates in cooling water as antifouling agents. Although cooling water usually does not come into direct contact with oil process streams, it also may contain some oil contamination due to leaks in the process equipment.

Water used in processing operations also accounts for a significant portion of the total wastewater treated in wastewater treatment plants. Process wastewater arises from desalting crude oil, steam-stripping operations, pump gland cooling, product fractionator reflux drum drains, and process blowdown. Because process water often comes into direct contact with oil, it is usually highly contaminated.

Petroleum refineries typically utilize primary and secondary wastewater treatment (Figure 4). Primary wastewater treatment consists of the separation of oil, water, and solids in two stages. During the first stage, an API separator is typically used. Wastewater moves very slowly through the separator allowing free oil to float to the surface and be skimmed off, and solids to settle to the bottom and be scraped off to a hopper used to collect sludge. The second stage utilizes physical or chemical methods to separate emulsified oils from the wastewater. Physical methods may include the use of a series of settling ponds with a long retention time, or the use of dissolved air flotation (DAF). In DAF, air is bubbled through the wastewater and both oil

and suspended solids are skimmed off the top. Chemicals, such as ferric hydroxide or aluminum hydroxide, can be used to coagulate impurities into a froth or sludge that can be more easily skimmed off the top. Some wastes associated with the primary treatment of wastewater at petroleum refineries may be considered hazardous and include: API separator sludge (K051), primary treatment sludge, and sludges from other gravitational separation techniques (F037), float from DAF units (K048), and wastes from settling ponds (F038).

After primary treatment, the wastewater can be discharged to a publicly owned treatment works or undergo secondary treatment before being discharged directly to surface waters under a National Pollution Discharge Elimination System (NPDES) permit. In secondary treatment, microorganisms may consume dissolved oil and other organic pollutants biologically. Biological treatment may require the addition of oxygen through a number of different techniques, including activated sludge units, trickling filters, and rotating biological contactors. Secondary treatment generates biomass waste, carbon dioxide, and water. The biomass is typically treated anaerobically, and then dewatered.

Some refineries employ an additional stage of wastewater treatment called polishing (tertiary treatment) to meet permitted discharge limits. The polishing step can involve the use of activated carbon, anthracite coal, or sand to filter out any remaining impurities, such as biomass, silt, trace metals, and other inorganic chemicals as well as any remaining organic chemicals. Other tertiary treatment processes that are available but not commonly employed in the treatment of refinery wastewater include ion exchange, reverse osmosis, and evaporation.

Certain refinery wastewater streams are treated separately, prior to the wastewater treatment plant, to remove contaminants that would not easily be treated after mixing with other wastewater. One such waste stream is the sour water drained from distillation reflux drums. Sour water contains dissolved hydrogen sulfide and other organic sulfur compounds and ammonia that are stripped in a tower with gas or steam before being discharged to the wastewater treatment plant.

### **C-2.3 Heat Exchanger Cleaning**

Heat exchangers are used throughout petroleum refineries to heat or cool petroleum process streams. The heat exchangers consist of bundles of pipes, tubes, plate coils, or steam coils enclosing heating or cooling water, steam, or oil to transfer heat indirectly to or from the oil process stream. The bundles are cleaned periodically to remove accumulations of scales, sludge, and any oily residues. Because chromium has almost been totally eliminated as a cooling water additive, wastes generated from the cleaning of heat exchanger bundles are not typically hazardous for chromium, as they were in the past. The sludge generated may contain small amounts of lead or chromium, although refineries that do not produce leaded gasoline and that use non-chrome corrosion inhibitors typically do not generate sludge that contains these constituents. Oily wastewater is also generated during heat exchanger cleaning.

### **C-2.4 Blowdown System**

Most refinery process units and equipment are manifolded into a collection unit, called the blowdown system. Blowdown systems provide for the safe handling and disposal of liquid and gases that are either automatically vented from the process units through pressure relief valves, or that are manually drawn from units. Recirculated process streams and cooling water streams are often manually purged to prevent the continued build up of contaminants in the stream. Part or all of the contents of equipment can also be purged to the blowdown system prior to shutdown before normal or emergency shutdowns. Blowdown systems utilize a series of flash drums and condensers to separate the blowdown into its vapor and liquid components. The liquid is typically composed of mixtures of water and hydrocarbons containing sulfides, ammonia, and other contaminants that are sent to the wastewater treatment plant.

### **C-2.5 Storage Tanks**

Storage tanks are used throughout the refining process to store crude oil and intermediate process feeds for cooling and further processing. Finished petroleum products are also kept in storage tanks before transport off site. Storage tank bottoms are mixtures of iron rust from corrosion, sand, water, and emulsified oil and wax that accumulate at the bottom of tanks. Liquid tank bottoms (primarily water and oil emulsions) are periodically drawn off to prevent their continued build up. Tank bottom liquids and sludge are also removed during periodic cleaning of tanks for inspection. In the past, tank bottoms may have contained amounts of tetraethyl or tetramethyl lead (although this has become rare due to the phaseout of leaded products), other metals, and phenols.

### **C-2.6 Cooling Towers**

Cooling towers cool heated water by circulating the water through a tower with a predetermined flow of ambient air pushed with large fans. A certain amount of water exits the system through evaporation, mist droplets and as bleed or blowdown to the wastewater treatment system. Therefore, make-up water in the range of about five- percent of the circulation rate is required.

### **C-2.7 Typical Refining Wastes**

Wastes are generated from many of the refining processes, petroleum handling operations, maintenance activities, as well as, wastewater treatment. Both hazardous and non-hazardous wastes are generated, treated and disposed. Residual refinery wastes are typically in the form of sludges, spent process catalysts, and filter clay. Treatment of these wastes typically

includes thermal desorption, incineration, land treating off-site, land filling onsite, land filling off-site, chemical fixation, neutralization, and other treatment methods.

A significant portion of the non-petroleum product outputs of refineries is transported off-site and sold as byproducts. These outputs include sulfur, acetic acid, phosphoric acid, and recovered metals. Metals from catalysts and from the crude oil that have deposited on the catalyst during the production often are recovered by third party recovery facilities.

The majority of solid waste generated at refineries is nonhazardous residual material. Most of these wastes are typically recycled within the refinery or are landfilled or treated on site as nonhazardous wastes. Some of these wastes were, historically, sent off site for treatment, land disposal, or land treatment (land farming). A number of wastes commonly generated at refineries, however, are hazardous under RCRA. A large number of different RCRA hazardous wastes are generated during wastewater treatment prior to discharge. RCRA wastes include:

- D001 flammable, ignitable;
- D002 corrosive materials;
- D003 reactive solids;
- D007 characteristic wastes containing chromium;
- D008 characteristic wastes containing lead;
- D018 characteristic wastes containing benzene;
- F037 primary sludge from the gravitational separation of oil/water/solids, and, if not recycled prior to disposal:
  - F038 secondary sludge from the gravitational separation of oil/water/solids;
  - K048 dissolved air flotation (DAF) sludge;
  - K049 slop oil emulsion solids;
  - K050 solids generated from cleaning of heat exchanger bundles;
  - K051 API separator sludge;
  - K052 leaded tank bottom corrosion solids;
  - K169 crude oil storage tank sediment from refining operations;
  - K170 clarified slurry oil storage tank sediment and/or in-line filter/separation solids from petroleum operations;
  - K171 spent hydrotreating catalyst from petroleum refining operations; and

- **K172 spent hydrotreating catalyst from refining operations.**

The NORF recycles oily process material that is exempt from RCRA regulation. Residual solids from material that would be F and K listed wastes if disposed, are classified as F037 and are handled as listed hazardous wastes.

### **C-2.8 Inherent Variability within Norco's Delisting Demonstration**

Oily process materials from petroleum processing are similar. The EPA has extensively characterized oily process material generated from petroleum refining operations since the establishment of the "Skinner List." The EPA has indicated that all oily process materials generated from petroleum refining wastewater treatment operations are similar in nature. This has been established by the EPA in several rulemakings (including 55 FR 46354, November 2, 1990 – the original listing determination for oily process material designated as F037 and F038 wastes) and the subsequent determination of land disposal restriction (LDR) treatment standards for F037 and F038 wastes (57 FR 37194, June 30, 1992).

In addition, Motiva uses the following procedures to assure predictable characteristics of feed material recycled to recover oil and treated at the NORF to generate residual solids:

- profiling prior to acceptance for processing at the recycling unit;
- conducting treatability testing of material prior to recycling; and
- controlling operational parameters used in the recycling operation, including residence time and temperature.

Historical analytical results for samples of residual solids generated in the recycling process indicate that these materials are uniform in composition and do not exhibit the properties of a characteristic hazardous waste.

Since the NORF recycles feedstocks of similar nature from a variety of sources, two sources have been evaluated during the Delisting Demonstration. Motiva has evaluated two sets of samples (recycled oily process materials and residual solids from the thermal desorption unit) from each of two batches of the following recycled material:

- BP America, Inc. (F037, and material that, if disposed, would be F038, K048, K049, K050, and K051); and
- Norco (F037, and material that, if disposed, would be F038, K048, K049, K050, and K051).

These two materials represent both the largest volume (20% to 25% and 45% to 50%, respectively) of recycled material and the widest variability in material anticipated to be recycled. Thus, the materials evaluated represent both the widest variability anticipated and at least 65% to 75% of the material processed through the thermal desorption unit.

Motiva is requesting a Conditional Delisting for residual solids generated at the NORF. The delisting applicability is conditional upon the residual solids meeting the delisting criteria in compliance with the conditional exclusion conditions determined by LDEQ. The basis for delisting will be the demonstration that residual solids generated as a result of the oil recovery process from oily process materials are nonhazardous. However, because the feed stream is subject to potential variation, the facility will also use stabilization for selected recycled feedstocks and an ongoing verification testing program as part of the conditional exclusion conditions to assure future compliance with the delisting criteria for the residual material.

### **C-3 WASTE MANAGEMENT OPERATIONS - OILY PROCESS MATERIAL RECYCLING AND TREATMENT BY THERMAL DESORPTION**

The following sections describe both the equipment and processing options used by Philip Services Corp. (Philip) to conduct recycling of refinery wastes at Norco.

### **C-3.1 GENERAL PROCESS DESCRIPTION**

The Philip thermal desorption recycling process consists of a dewatering system (centrifuge) followed by a high temperature thermal desorption unit. Philip's thermal desorption recycling process utilizes an indirect heated Rotary Tube Furnace (RTF) to thermally treat refinery oily process material dewatered by the centrifuge. The RTF processes dewatered oily process material in controlled atmospheres up to temperatures of 1,400°F. Organics and water are recovered from the vapors via an off-gas treatment system.

Philip's thermal desorption recycling process was developed to provide the maximum volume reduction of the refinery sludge while recovering essentially all of the hydrocarbons for reuse. Since the major constituent of the sludge is water, recovering and discharge of treated water provides a significant reduction in the volume of recycled oily process material. During the recycling process, the dewatered oily process material is loaded into the RTF unit for thermal treatment using a front-end loader. Operating at an average of 1,400°F, the furnace vaporizes most of the hydrocarbons and all of the water from the centrifuged oily process material. After an approximate residence time of 30 minutes, the recycled oily process material exits the sloped rotary tube as hot dried residual solid, to a "hollow-flight," water-jacketed, cooling screw conveyor. The residual solids are cooled from 1,000°F to approximately 150°F, where they are collected in a roll-off bin for transportation.

The 1,000°F vapors from the RTF are drafted under a slightly negative pressure induced by the positive displacement blower to the venturi scrubber/quench tank for saturation sub-cooling (to approximately 180°F), particulate removal and pre-condensing. Gas entering the venturi scrubber is split into two streams after atomized water injection. The relative high velocity shreds the drops into finer ones that more effectively collect sub-micron particles and produce a larger mass transfer area. The 180°F vapors enter the vertical wet scrubber for further cooling,

condensing, scrubbing and particle removal.

Quench/cooling water for the scrubber system and the cooling screw is supplied from the oil/water separator by a centrifugal pump after being cooled to approximately 80°F. Excess water is pumped to a local process sewer and then back to the Norco Refinery wastewater treatment plant. The condensables collected in the cyclonic wet scrubber reservoir are automatically pumped to the flotation cell for oil/water separation. Emissions from the centrifuge and the mixing tank are drafted to the cyclonic wet scrubber through the vapor header for on-site odor/emission control.

A more complete description of Philip's indirect gas fired and associated support equipment is included in the following sections.

**ENTRANCE BREECH AND SEAL ASSEMBLY** - The entrance breech assembly is constructed of 304 Stainless Steel and is equipped with a vent pipe at the top for connection to the Vapor Recovery System (VRS). The seal assembly utilizes a stainless steel bellows to handle any thermal expansion of the tube. A machined graphite wiper ring provides a "friction-free" sealing surface.

**THERMAL TUBE ASSEMBLY** - The rotating thermal tube is constructed from centrifugally cast high temperature alloy. The tube measures approximately 33 feet in length, with an internal diameter of 43 inches. The heated portion of the tube is approximately 20 feet in length. The entrance end and discharge tubes are made of centrifugally cast CF-8 alloy, and each measures approximately 4 feet in length, with an internal diameter of 43 inches.

Mounted at each end of the tube assembly is a "Riding Ring" assembly. The riding ring turns smoothly on a water-cooled roller bearing trunion assembly. The riding ring and trunions are flame hardened to ensure long life.

The tube drive system incorporates a variable speed drive to effectively control the speed of the tube rotation from zero to ten rotations per minute. A digital tachometer is provided to indicate tube rotational speed to the furnace operator.

**FIRING CHAMBER** - The furnace is heated by an Eclipse natural gas-fired combustion system. The combustion system, consisting of 8 burners, is mounted on the bottom side of the furnace. Each burner is equipped with a blocking valve to enable individual burner startup. These burners are also equipped with flame safety devices that ensure, in the event of flame failure, only the burner affected will be shut down.

There are 3 zones of temperature control along the longitudinal axis of the tube that provide temperature uniformity and profiling as the solids travel the length of the tube. The first zone measures 10 feet in length and incorporates 4 burners with a total heat input of 5.0 million BTU/hour. The second and third heating zones each measure 5 feet in length and each has a heat input of 1.5 million BTU/hour. The residual heating value in the recovered vent gas can be utilized in any or all of the burners to provide as much as an additional 2.0 million BTU/hour.

The furnace is insulated by 9 inches of insulating firebrick. The roof utilizes a ceramic fiber design. This insulation provides for minimal heat loss and high furnace efficiency. The firing chamber is fitted with thermocouple glands to accept three dual Type "K" thermocouples.

**DISCHARGE BREECH AND SEAL ASSEMBLY** - The discharge breech and seal assembly is similar in design and construction to the entrance end. There is an open flange provided at the discharge point of the assembly to connect a nitrogen purge rotary airlock valve. This device will ensure atmospheric integrity inside the rotating tube.

**COOLING SCREW** - The cooling screw auger, built by Christian Engineering, can handle 1,500 pounds per hour of hot solid material and cool it from 1,200°F to 150°F. The hollow

screw operates in a water-cooled, jacketed trough of carbon steel construction that is equipped with a five horsepower mechanical variable speed, explosion-proof gearmotor with OSHA-approved chain drive.

**VAPOR RECOVERY SYSTEM** - The vapors from the RTF are drafted into a Vapor Recovery System (VRS) to remove the condensable liquids for recovery and recycle, while the remaining vapors are used as a fuel. The VRS utilizes a simplified design to minimize fouling from the heavy hydrocarbons and to provide effective liquid/vapor separation.

The first stage of the system is a venturi wet scrubber with an adjustable throat valve designed to cool the vapors from 1,400°F to 180°F and provide adequate capacity for removing the condensables and fine particulates from the gas stream. The gas then flows into a wet scrubber. The wet scrubber removes the condensed hydrocarbons and fine particles from the vapors by utilizing centrifugal forces and impingement of water with the fine oil and solids particles. An induced draft blower, which provides a slight negative pressure in the VRS and RTF, pulls the non-condensable gases from the scrubber and exhausts the stream to either be utilized in the combustion chamber of the RTF, or sent to a vapor collection system.

The second objective of the VRS is to cool the process gasses and condensate to a saturation temperature of 150°F. The make-up water flow and the temperature of the make-up water control this temperature. The major portion of the cooling and condensing will occur in the venturi, which is sized from the maximum conditions of gas flow. The rotary wet scrubber cools, condenses, and recovers the aerosol "particles" produced in the venturi.

Exhaust from the VRS includes approximately 100 scfm of "leakage" air that is introduced between the venturi and the rotary to control the fugitive emissions from the mix tank, centrifuge, and oil/water separator.

**OIL/WATER SEPARATOR** - The condensed liquids from the VRS are pumped to an

induced air flotation unit. The main function of this unit is to remove the oil from the condensed liquids and recover the water for reuse as quench water in the VRS. The unit also provides a system to separate the water for return to the wastewater treatment system and the oil to be sent to the slop oil tank.

## **C-3.2 Waste Processing**

Philip manages four types of waste streams at Norco. Philip uses a centrifuge/thermal dryer combination to process the different materials. The unit can be run in three different operating modes. The process options and criteria for selecting each option are discussed below.

### **C-3.2.1 Process Options**

In general, the centrifuge/thermal dryer can be operated under three different process options. Sludges can be run through the centrifuge alone to remove the majority of the water and the oil and grease. This will typically produce a centrifugal cake with approximately 40 percent solids, 15 percent oil and grease, and 45 percent water. This material can be disposed of, as is (with non-hazardous waste streams) or run through the dryer for further volume reduction. The dryer is typically operated under a high temperature mode.

The dryer is operated in the high temperature mode to meet applicable treatment standards for the K and F wastes. The resulting residue typically contains approximately ten percent water (added back to control dust emissions) and 90 percent solids. The advantage of the high temperature mode is that the wastes can be directly landfilled instead of the more costly options of incineration or destruction in cement kilns (used as a fuel). In addition, the tonnage requiring disposal is further reduced.

A summary of the typical content of the solids generated from each option (assuming initiating operations with 100 lbs. of centrifuge cake) is provided below:

	Centrifuge Cake		High Temp Residue	
	<u>Percent</u>	<u>Pounds</u>	<u>Percent</u>	<u>Pounds</u>
Oil & Grease	15	15	0	0
Water	45	45	10	05
Solids	40	40	90	40
TOTAL	100	100	100	45

As the table illustrates, the dryer will reduce the weight of waste to be disposed by a minimum of 50 percent over centrifuging alone; however, the disposal cost for non-hazardous wastes make thermally treating this material cost prohibitive.

Below is a detailed discussion of how Philip processes each of the different waste streams:

#### **C-3.2.1.1 Non-Hazardous Waste**

Sludges are transported via vacuum trucks (low solids content sludges) or King Vacs (high solids content sludges) to the processing area. Once transferred to the processing area, the sludges are off-loaded from the trucks and pumped over a double decker shaker screen. Gross debris not passing through the screen drop into a roll-off container for temporary storage, while the remainder of the sludge is pumped to one of two, 500-barrel mix tanks. Once in the mix tanks, the sludge is heated and chemically treated, if required. The sludge is pumped from the mix tanks to the centrifuge for oil/water/solids separation. Prior to entering the centrifuge, polymers are injected with a chemical makedown system to "floc" the solids from the sludge. The chemical makedown/injection system is a Polyblend PB-600 system that utilizes a combination of chemical metering pumps, mixing chambers, and static mixers to activate the

polymer prior to injection.

Inside the centrifuge, the "flocced" solids are subjected to 2,100 Gs of centrifugal force. This force compresses the solids to the external bowl of the centrifuge. During this compression phase, the solids are conveyed to the conical end of the bowl by the internal scroll. Once at the conical end of the bowl, the solids are discharged through a series of ports to a screw conveyor. The screw conveyor cools the material and moves the material to a roll-off container. Once the roll-off container is filled, the dewatered solids are scheduled for transportation and disposal at a Norco-approved industrial landfill. Due to the low disposal costs of non-hazardous wastes, additional treatment is not warranted and all of the non-hazardous waste sludges are handled in this manner.

#### **C-3.2.1.2 Characteristically Hazardous Waste (Organics Only)**

The initial processing steps for the waste streams characteristically hazardous due to organics is the same as for the non-hazardous streams. However, during the processing of these streams, all of the vapors from the mix tanks, centrate tanks, and the centrifuge are vented to the thermal dryer. The thermal dryer used by Philip is an indirect-fired, rotary tube furnace. This system is downstream of the centrifuge and is used to desorb the organic hazardous constituents from the centrifuge solids. The desorbed organics are condensed and collected in a vapor recovery system and any non-condensable organics are returned to the dryer for use as a fuel supplement in the combustion chamber.

The primary compound of concern during the desorption of the characteristically hazardous waste streams is benzene. To effectively remove this compound, Philip operates the dryer at approximately 1,400°F firebox temperature. At this temperature, all of the water and oil is volatilized and drafted via an induced fan to the vapor recovery system for collection. The vapor recovery system consists of a cyclonic scrubber that cools the off-gases to approximately

180°F. A counter-current water scrubber that further condenses organics and water from the vapor stream follows this vapor recovery system. Condensed oil and water collected in the counter-current water scrubber is pumped through a series of tanks for separation. The oil is returned to the Norco Refinery and the water is recycled to the scrubber system. Non-condensable organics are returned to the dryer for oxidation in the combustion chamber.

After removal of organics from the waste streams, the solids are no longer classified as hazardous. The solids from the dryer are then delivered to a roll-off container for transportation and disposal at a Norco-approved industrial landfill. Waste streams that are characteristically hazardous due to inorganics will still be processed through the dryer but will require stabilization prior to disposal at a Norco-approved industrial waste landfill. Recovered oil is returned to the Norco Refinery via the process line provided by Norco. Cutter stocks are utilized as necessary to ensure the gravity of the recovered oil is acceptable to Norco's slop oil system. Centrate water is tested for total dissolved solids (TSS) and total organic carbon (TOC) prior to discharging to Norco.

#### **C-3.2.1.3 K and F Wastes**

Processing of K and F wastes is performed utilizing the same system as described for processing the characteristically hazardous waste streams. The primary difference is the operating temperature of the rotary tube furnace. To meet the Universal Treatment Standards, Philip operates the system at approximately 1,400°F. At this temperature, 100 percent of the water and oil and grease is typically removed from the solids. Recovered oil from the off-gas treatment system requires blending with cutter stock at a rate of approximately 1 to 1 for gravity adjustment prior to return to Norco's slop oil system.

The residual solids are discharged from the dryer into a cooling screw. The cooling screw conveys the solids into a roll-off container for transportation and disposal at a Norco-approved

hazardous waste landfill. As with the recovered oil and water from the non-hazardous and characteristically hazardous waste streams, testing is performed and compliance with Norco's specifications is achieved prior to discharge to the slop oil system.

#### **C-3.2.2 Process Controls/Vapor Recovery**

The processing equipment installed on the process pad meets all of Norco's electrical classification requirements. Hard piping is utilized to connect the process equipment to minimize the potential for leaks and spills. All tanks and areas for potential emissions are piped into a vapor recovery system for emissions control. In operations where the dryer is not used, the vapors are directed through two carbon canisters connected in series before emission to the atmosphere. In operations where the dryer is used, the vapors are drafted to the dryer for use as a fuel supplement in the combustion chamber.

#### **C-3.2.3 Quality Assurance/Quality Control**

Quality Assurance/Quality Control measures have been implemented throughout the history of operation of the unit. Philip's Quality Assurance/Quality Control Plan addresses the areas of most concern, including quality evaluation and monitoring of both the recovered oil/water and the residual solids generated from the process equipment. The following sections briefly describe the methods employed to ensure quality performance.

#### **C-3.2.4 Recovered Oil/Water**

The processing of each of the identified waste streams results in the recovery of oil and water from the sludge. Prior to the processing of each stream, Philip typically performs a thorough

treatability study to determine the chemicals required to effectively separate the liquid and solids in the centrifuge. The liquid phase from the centrifuge is pumped to a set of tanks for primarily water separation. The oil is pumped to a good oil tank for Basic Sediment and Water (BS&W) Testing. This testing is performed in accordance with API procedures. Material meeting the four percent BS&W criteria is pumped back to the Norco Refinery using the line provided by Norco. Recovered oil exceeding the four percent BS&W specification is reprocessed until the specification is met.

Recovered water is pumped through an oil/water separator and then to one of two frac tanks for temporary storage. The water is then tested for TSS and TOC.

These tests are performed in accordance with the "Standard Methods for the Examination of Water and Wastewater," 17th Edition, 1991. Water not meeting the 1,000 mg/L specifications is reprocessed through an induced air flotation (IAF) unit. If the material does not meet the criteria after treatment through the IAF, activated carbon is utilized as a final treatment resource.

#### **C-3.2.5      Residual Solids**

Quality Assurance/Quality Control measures for the residual solids have been implemented to evaluate management requirements for the waste stream being processed. Once a roll-off container is filled with the non-hazardous material, the paint filter test is performed to ensure landfill acceptance criteria are met. During the course of processing non-hazardous waste, Philip generates a centrifuge cake that typically contains an average of 40 percent solids. Philip guarantees meeting the paint filter criteria for landfill acceptance. Philip tests the residual solid from the thermal dryer daily for total percent solids. The thermal dryer removes 100 percent of the water from the solids. To minimize potential dusting problems, Philip adds about ten percent water and a polymer back to the solids. This addition of water is required for both the

characteristically hazardous wastes and K and F waste streams. Due to the extremely low moisture content, the paint filter test is not performed on the dried material. These waste streams require periodic analytical testing to ensure compliance with treatment standards. Typically, every fifth roll-off container of the respective waste stream is sampled and analyzed to evaluate management requirements. Residual material derived from listed hazardous wastes is shipped to either one of Chemical Waste Management's facilities, located in Carlyss, Louisiana or Emelle, Alabama.

#### **C-4 SPECIAL INFORMATION**

Motiva uses the following procedures to assure uniform characteristics of feed material recycled to recover oil and treated at the NORF to generate residual solids:

- profiling prior to acceptance for processing at the recycling unit;
- conducting treatability testing of material prior to recycling; and
- controlling operational parameters used in the recycling operation, including residence time and temperature.

Potential waste streams must contain a minimum of 5% total petroleum hydrocarbons and are profiled into the NORF using standard profile forms developed by Motiva. These forms are completed by potential clients and are shipped to the NORF along with representative samples of the material. The profile is reviewed by the NORF Project Manager and signed prior to submittal to Motiva representatives for review and approval. Once approved by Motiva, the client is notified of the acceptance, is issued a waste data number, and may begin scheduling materials into the facility. Waste may be shipped as liquids, sludges, or solids. Liquids and sludges are typically shipped via vacuum truck and roll-off containers are usually used for solids.

Shipments to the facility are issued a unique tracking number, which is used to track each load.

Once received at the NORF, the materials are off-loaded into a 3-sided box or one of the process mix tanks. Once into the process, the residuals are dewatered, if necessary, and processed through the thermal desorption unit. Recycled oil is returned to Norco's Slop Oil System for recovery at the coker. Water from the process is returned to the Norco Refinery wastewater treatment plant.

The NORF has the capability to apply stabilization materials to both the feedstock to the unit, and to the treated residual solids exiting from the unit (Figure 10).

## **Section D: ANALYTICAL PLAN DEVELOPMENT**

### **D-1. PLAN DEVELOPMENT AND LISTING OF CONSTITUENTS AND PARAMETERS OF CONCERN [LAC 33: V. 105 M. 3. b]**

Norco evaluated potential constituents of concern associated with petroleum processing and treatment of process wastewater from petroleum refining. Available information sources were utilized including:

- the EPA Integrated Risk Information System (IRIS);
- the Revised "Skinner List" (i.e., Constituents of Concern for Wastes from Petroleum Processes) Exhibit 6.3 Petitions to Delist Hazardous Waste - Guidance Manual, Second Edition, March 1993, EPA/530-SW-85-003;
- De-Listing Hazardous Waste in Louisiana, Draft Guidance, October, 1995, LaDEQ; and
- Region 6 RCRA Delisting Program Guidance Manual for the Petitioner, March, 2000, USEPA.

Additional references utilized included the following:

- Docket Report on Health-Based Levels and Solubilities Used in the Evaluation of Delisting Petitions Submitted under 40 CFR 260.20 and 260.22 - EPA - OSW/ER Contract Number 68-W9-0091, July 1991.
- Pollutant-Specific Justification for Analytical Data to Support Delisting Petitions for Petroleum Refinery Wastes. Letter (and materials) to EPA's Mr. B. Smith from Science Applications International Corporation's (SAIC) Mr. E. McNicholas, April 9, 1986.
- U.S. EPA, 1990. Draft Interim Policy for Estimating Carcinogenic Risks Associated with Exposures to Polycyclic Aromatic Hydrocarbons; EPA OSW/ER Directive 9285.4-02.

Following evaluation of available references and discussions with representatives of LDEQ in meetings on April 9, 1998 and September 8, 1998, it was decided to conduct the following

analyses for the first sampling event:

- Appendix IX analysis for the first sample of residual solid (both total and TCLP extract);
- Oil and grease, corrosivity, ignitability, reactive cyanide, and reactive sulfide for the residual solid;
- total volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals (Appendix IX) analysis for oily process feed material;
- VOCs, SVOCs, metals, organochlorine pesticides and PCBs, and organophosphate pesticides on matrix spike and matrix spike duplicate samples;
- VOCs, SVOCs, and metals (Appendix IX) for field blanks; and
- VOCs and metals (Appendix IX) for trip blanks.

The analytical methods for each group of constituents of concern are (Appendix E-1):

- volatile organic compounds were determined by purge and trap GC/MS, utilizing EPA Method 8240;
- semivolatile organic compounds were determined by solvent extraction and GC/MS, utilizing EPA Method 8270;
- metals were prepared using EPA Method 3010, except where alternative methods are specified by EPA/SW-846. After preparation, metals were determined by atomic absorption using required variations of EPA Method 7000;
- TCLP leachate was generated utilizing EPA Method 1311. The leachate was prepared using EPA Method 3010 for all metals except where alternative methods are specified by EPA/SW-846. After sample preparation, metals were determined by atomic absorption using required variations of EPA Method 7000;
- oil and grease was analyzed utilizing EPA Method 413.1 modified for soils;
- corrosivity was evaluated utilizing EPA Method 9040;
- ignitability was evaluated utilizing EPA Method 1010; and
- reactive cyanide and sulfide were evaluated utilizing EPA Office of Solid Waste guidance procedures.

Method detection limits are listed in the Quality Assurance Project Plan (Appendix E-2).

The initial sampling event was conducted on September 11, 1998 on material recycled from BP America, Inc. Once the results of the analytical program for the first event were reviewed and

discussed with LDEQ, the analytical program for Sampling Events 2, 3, and 4 was revised to:

- Skinner List + TCLP List VOCs, SVOC, and Appendix IX metals on the TCLP extract of the residual solid;
- oil and grease, corrosivity, ignitability, reactive cyanide, and reactive sulfide for the residual solid;
- Skinner List + TCLP List VOCs, SVOCs and Appendix IX metals analysis for oily process feed material;
- Skinner List + TCLP List VOCs, SVOC, and Appendix IX metals on matrix spike and matrix spike duplicate samples;
- Skinner List + TCLP List VOCs and SVOCs and Appendix IX metals for field blanks; and
- Skinner List + TCLP List VOCs and Appendix IX metals for trip blanks.

The Stabilization Demonstration (Sampling Event 5) consisted of evaluation of three potential procedures using two different stabilizing materials using BP America, Inc. feedstock over the period July 5 – 7, 2000.

Samples to characterize recycled material and recycled and stabilized material included:

- TCLP extraction and analysis of Appendix IX metals on samples of treated, but not stabilized, residual solids;
- MEP extraction and analysis of the initial extract for Appendix IX metals, with subsequent extracts (extracts 2 through 9 and higher) being analyzed for antimony and nickel.
- Appendix IX metals for field blanks; and
- Appendix IX metals for trip blanks.

All procedures used followed the approved SAP, SAP Addendum and QAPP. All data were validated.

## **Section E: SAMPLING AND ANALYSIS INFORMATION**

### **E-1 SAMPLING AND ANALYSIS PLAN**

A Sampling and Analysis Plan (SAP) and a Quality Assurance Project Plan (QAPP) were submitted to LDEQ in September 1998. An addendum to the approved Sampling and Analysis Plan was submitted to the LDEQ on June 22, 2000 to describe Stabilization Demonstration activities. Copies of all are included in Appendix E.

### **E-2 WASTE SAMPLING INFORMATION - NAMES AND ADDRESSES OF FACILITIES PERFORMING SAMPLING AND TESTING [LAC 33: 105 M. 7. a; LAC 33: 105 M. 7. b and LAC 33: 105 M. 7. i]**

Personnel performing sampling and testing associated with Norco's Delisting Demonstration include:

#### **FACILITY PERFORMING SAMPLING**

Philip Services Corp.  
268 Power Boulevard  
Reserve, Louisiana 70084  
(800) 536-7689  
Mr. Steve Bone, Project Manager

## FACILITY PERFORMING TESTING OF SAMPLES

All analyses except dioxins and furans:

PACE Analytical Services, Inc.  
1000 Riverbend, Suite F  
St. Rose, Louisiana 70087  
(504) 469-0333  
Ms. Cindy Olaveson, Project Manager

Analyses for dioxins and furans:

Triangle Laboratories, Inc.  
801 Capitola Drive  
Durham, N.C. 27713  
(919) 544-5729  
Mr. Phil Fields, Project Manager

## ORGANIZATION PERFORMING DATA VALIDATION SERVICES

O'Brien & Gere Engineers, Inc.  
222 Forbes Road, Suite 400  
Braintree, Massachusetts 02184  
(315) 682-6178  
Ms. Melissa Listman, Project Manager

Personnel performing sampling and testing associated with Norco's Delisting Demonstration include the following.

All samples collected during Norco's Delisting Demonstration originated from the NORF and were collected under the direct supervision of Mr. Steve Bone. Mr. Bone has managed operation of the NORF since April 1994. Mr. Bone holds a B.S. in Civil Engineering (Louisiana State University, 1985) and is a Registered Professional Engineer in the State of

Louisiana (Civil Engineering, 1992; Environmental Engineering, 1994).

Mr. Jeremy P. Leonick collected all samples. Mr. Leonick reports directly to Mr. Bone. Mr. Leonick holds a B.S. in Environmental Management Systems (Louisiana State University). Mr. Leonick has worked for Philip since May, 1997 and is the Operations Manager for the NORF.

Dr. James Pinta Jr., Ph.D. provided technical assistance during sampling and analysis. Dr. Pinta is the Branch Manager of Apex Environmental in Pittsburgh, Pennsylvania, the contractor hired by Philip to assist in development of the Delisting Petition. Dr. Pinta worked for Philip for nine years (March, 1989 - March, 1998). Dr. Pinta holds the following degrees: B.A. in Geology (Lawrence University, 1973), M.S. in Geological Sciences (University of Wisconsin-Milwaukee, 1975); and Ph.D. in Geochemistry and Mineralogy (Penn State University, 1981). Dr. Pinta has managed numerous projects for Philip including sampling and analysis plan design and implementation, quality assurance/quality control programs, and risk assessments.

Complete descriptions of sampling methodology, preservation techniques, and program organization for Norco's Delisting Demonstration are contained in the Sampling and Analysis Plan, Sampling and Analysis Plan Addendum, and Quality Assurance Project Plan in Appendix E

Appendix E-2 and Appendix F-1 contain detailed descriptions of quality control/assurance procedures used by PACE relative to analytical testing conducted during Norco's Delisting Demonstration. Complete descriptions of preservation techniques, quality assurance/quality control, and analytical requirements for Norco's Delisting Demonstration, are contained in the Sampling and Analysis Plan and Quality Assurance Project Plan (Appendix E-1). Individuals performing analyses are listed in the Quality Assurance Project Plan in Appendix E and the analytical reports in Appendix F-1.

### E-3 SAMPLING STRATEGY [LAC 33: 105 M. 7. b]

Demonstrations were conducted on materials representative of both the vast majority (about 75%) and the greatest anticipated variability of material processed at the NORF. These demonstrations included the:

- Initial Delisting Demonstration, consisting of Sampling Events 1, 2, 3, and 4; and
- Stabilization Demonstration, consisting of Sampling Event 5.

These sampling events are described below.

#### E-3.1 Initial Delisting Demonstration

The NORF oily process materials feedstock and residual solids are relatively consistent and uniform in nature and composition. Because the NORF recycles feedstocks of similar nature from a variety of sources, two sources were selected for characterization for the Initial Delisting Demonstration. Motiva collected two sets of samples (recycled oily process materials and residual solids from the thermal desorption unit) from each of two batches of the following recycled material:

- BP America, Inc. (F037, F038, K048, K049, K050, and K051); and
- Norco (F037, F038, K048, K049, K050, and K051).

K171 / K172  
NOT INCLUDED

These two materials represent both the largest volume (20% to 25% and 45% to 50%, respectively) of material recycled at the NORF and the widest variability in material anticipated to be recycled at the NORF. For these reasons, Motiva believes these samples are representative of material processed at the NORF.

Each set of samples consisted of a 24-hour composite sample collected to obtain representative samples of the batch's oily process materials mixture and residual solids (except for volatile analyses, which consisted of one grab sample collected during the day shift). Each 24-hour composite sample consisted of three individual grab samples, obtained at a minimum of 6- to 8-hour intervals during a representative 24-hour sampling event. The grab samples were composited in the laboratory by Pace.

Representative samples of Norco's oily process materials mixture were obtained as follows:

- grab samples were collected at the inspection hatch on the thermal desorption unit using a disposable stainless steel scoop (this material represents the true feed to the dryer and is in the form of a centrifuge cake after being dewatered);
- one grab sample (from the late morning shift) was collected and analyzed for VOCs;
- three grab samples collected at 6- to 8-hour intervals were collected for SVOCs and metals and composited in the laboratory to be representative of the 24-hour shift; and
- for the first sampling event, one complete set of sample containers was collected as a field blank using laboratory-prepared water during each sampling event and a composite will be prepared and analyzed for SVOCs and metals; the grab sample from the late morning shift will be used to determine VOCs. For subsequent sampling events, only grab samples for SVOC and metals were collected and analyzed.

Motiva's residual solids exit the thermal desorption process to roll-off containers via a rotary screw cooling device. Because the residence time of material processed through the NORF is about 30 minutes, samples of residual solids were collected about 30 minutes after samples of oily process feed materials were collected. In this manner, samples of residual solids represent the same material sampled as feed.

Representative samples of Motiva's residual solids were obtained as follows:

- grab samples of residual solids were collected as they exit the rotary cooling screw directly into sample containers;
  - one grab sample (from the late morning shift) was collected and analyzed for VOCs;

- for the first sampling event, a second grab sample (from the late morning shift) was collected and analyzed for TCLP VOCs;
- three grab samples collected at 6- to 8-hour intervals were collected for Appendix IX analysis (both total and leachate) and the following parameters and then composited in the lab to be representative of the 24-hour shift (volatiles were determined on the grab sample collected during the afternoon shift):
  - oil and grease;
  - ignitability;
  - corrosivity;
  - reactive cyanide;
  - total cyanide;
  - reactive sulfides.
- the first sample collected served as the MS/MSD sample and consisted of an additional amount of samples equal to three times the standard value of samples required for analysis (three grab samples for each suite of analyses, except for VOCs).

Trip blanks were prepared in the laboratory and accompanied the shipment of sample containers to the NORF and were shipped back to the laboratory with the samples and analyzed for VOCs, SVOCs and metals for the first event, and VOCs and metals for subsequent events.

Field blanks were prepared in the field by pouring analyte-free water prepared at the laboratory over the disposable stainless-steel spoon sampling device into appropriate bottles in the field at the time of sampling. These samples were analyzed for VOCs, SVOCs and metals

Individual grab samples were delivered by Philip representatives to Pace in St. Rose, Louisiana following handling, preservation, and chain-of-custody procedures outlined in SW-846 (Appendix E-3 and Appendix F-1).

Detailed field notes, copies of field log books, analytical sample requests, sample logs, and chain-of-custody forms for all sampling events are included in Appendix E-3.

### **E-3.2 Stabilization Demonstration**

Motiva's Stabilization Demonstration consisted of evaluation of three potential procedures using two different stabilizing materials:

- application of hydrated lime (50 pounds per ton feed) to OPM feed material at the live bottom;
- application of Star Organics SPF (0.5 gpm) to OPM at the feed auger; and
- application of Star Organics SPF (0.5 gpm) to residual solids at the cooling screw.

Samples selected to characterize recycled material and recycled and stabilized material include:

1. three grab samples of treated, but not stabilized, residual solids were collected at about:
  - 4-hour intervals for the hydrated lime application;
  - 2- hour intervals for the Star Organic Fluid application to the feed material; and
  - 0.75 hour intervals for the Star Organic Fluid application to the product material.These samples were composited and analyzed for Appendix IX list metals after extraction using the TCLP.
2. three grab samples of treated and stabilized residual solids collected following collection of the treated, but not stabilized samples detailed above after about:
  - 2 hours for the hydrated lime application;
  - 1 hour for the Star Organic Fluid application to the feed material; and
  - 0.25 hour for the Star Organic Fluid application to the product material.
  - These samples were extracted using the MEP. The initial extract was analyzed for Appendix IX metals, with subsequent extracts (extracts 2 through 9) analyzed for antimony and nickel.

Trip blanks were prepared in the laboratory and accompanied the shipment of sample containers to the NORF and were shipped back to the laboratory with the samples and analyzed for Appendix IX metals.

Field blanks were prepared in the field by pouring analyte-free water prepared at the laboratory

into appropriate bottles in the field at the time of sampling. These samples were analyzed for Appendix IX metals.

Individual grab samples were delivered by Philip representatives to Pace in St. Rose, Louisiana following handling, preservation, and chain-of-custody procedures outlined in SW-846 (Appendix E-3 and Appendix F-1).

Detailed field notes, copies of field log books, analytical sample requests, sample logs, and chain-of-custody forms for all sampling events are included in Appendix E-3.

All procedures for all five sampling events followed the approved SAP, SAP Addendum and QAPP. All data were validated.

#### **E-4 SAMPLE SPECIFIC INFORMATION [LAC 33: V. 105 M 7. c]**

Five sampling events were conducted to evaluate samples as part of the Initial Delisting Demonstration and subsequent Stabilization Demonstration. Sampling, as described in Section E-3 was conducted on the following dates:

- September 11, 1998;
- January 27, 1999;
- April 27, 1999;
- May 12, 1999 and
- July 5 – 7, 2000.

Sample identification numbers were assigned according to the Sampling and Analysis Plan and Sampling and Analysis Plan Addendum (Appendix E-A-1). Complete sample descriptions and detailed notes for sampling activities are included in Appendix E-3. Laboratory identification

numbers assigned to specific samples and dates of sample analysis are indicated in Appendix F-1. These data are summarized in Table 9. Data Validation Reports in Appendix G.

**E-5 WASTE ANALYSIS INFORMATION [LAC 33: V. 105 M. 7. j and LAC 33: V. 105 M. 7. k]**

Pace conducted all compositing of samples and all analytical work, except for dioxin and furan analyses conducted by Triangle Laboratories, Inc. All work was conducted according to procedures established in SW-846. All signed and validated data reporting forms and associated quality assurance/quality control information, including names and model numbers of instruments used in the analytical testing, are presented in the Quality Assurance Project Plan (Appendix E-1-B) and in the analytical reports (Appendix F-1). All data were validated against criteria established in the Quality Assurance Project Plan (Appendix E-1-B). Data validation reports are in Appendix G.

**Section F: DISCUSSION OF RESULTS**

**F-1. THE PETITIONER MUST DEMONSTRATE THAT THE WASTE, DOES NOT CONTAIN THE CONSTITUENT OR CONSTITUENTS (AS DEFINED IN LAC 33: V. 4901. G. TABLE 6) THAT CAUSED THE ADMINISTRATIVE AUTHORITY TO LIST THE WASTE, USING THE APPROPRIATE TEST METHODS DESCRIBED IN "TEST METHODS FOR EVALUATING SOLID WASTE, PHYSICAL/CHEMICAL METHODS," EPA PUBLICATION SW-846, AS INCORPORATED BY REFERENCE BY LAC 33; V. 105 M. 3. a. 1.]**

Oily process material recycled at the NORF generates residual solids that are classified as newly generated hazardous wastes having the waste code F037 that is listed in LAC 33: V. 4901. G. Table 6 as having benzene, benzo(a)pyrene, chrysene, lead, and chromium as the basis for listing the waste as hazardous. Norco's Delisting Demonstration did not detect these constituents of concern in TCLP leachate from residual solids resulting from the recycling of oily process materials by thermal desorption at the NORF. It is Norco's contention that standard operating procedures at the NORF will remove all organic constituents of concern to levels below regulatory concern. All inorganic constituents of concern are below levels of regulatory concern. Analytical results of TCLP extractions conducted on both grab samples (for volatiles) and composite samples (for other constituents) of the residual solids generated by the NORF during Norco's Delisting Demonstration, are presented in Appendix F-1 and summarized in Tables 2 and 3.

**F-2 THE PETITIONER MUST DEMONSTRATE THAT THE WASTE, BASED ON OTHER FACTORS (ADDITIONAL CONSTITUENTS OTHER THAN THOSE FOR WHICH THE WASTE WAS LISTED), DOES NOT WARRANT RETAINING THE WASTE AS A HAZARDOUS WASTE [LAC 33: V. 105 M. 3. b.]**

Norco acknowledges the presence, at low concentrations, of the following constituents of concern in TCLP leachate from residual solids resulting from the recycling of oily process materials by thermal desorption at the NORF (Table 2):

- carbon disulfide (sample # 1);
- diethylphthalate (sample # 2);
- antimony (samples # 1 and 2)
- arsenic (sample # 4);
- barium (samples # 1, 2, 3, and 4);
- mercury (sample # 1);
- nickel (samples # 2 and 3);
- selenium (samples # 2 and 4);
- silver (sample # 1); and
- zinc (sample # 2).

*Vanadium?*

Stabilization with hydrated lime decreased antimony available for leaching below levels of regulatory concern and below levels of anticipated delisting criteria. Other inorganic constituents had slight increases concentration in the stabilized material; however, the levels observed are well below the levels of regulatory concern (Table 3).

The presence of these constituents of concern, at concentrations below levels of regulatory concern and below anticipated delisting criteria levels, does not warrant management of residual solids generated at the NORF as a hazardous waste. Analytical results of TCLP extractions conducted on both grab samples (for volatiles) and composite samples (for other constituents) of the residual solids, and MEP extractions of the stabilized residual solids generated by the NORF during Norco's Delisting Demonstration, are presented in Appendix F-

1 and summarized in Tables 2 and 3.

**F-3 THE PETITIONER MUST DEMONSTRATE THAT THE WASTE DOES NOT EXHIBIT ANY OF THE CHARACTERISTICS DEFINED IN LAC 33: V. 4903 USING ANY APPLICABLE METHODS PRESCRIBED THEREIN [LAC 33: V. 105 M. 3. c.]**

Norco's Delisting Demonstration successfully documented that residual solids resulting from the recycling of oily process materials by thermal desorption at the NORF do not exhibit any of the characteristics of a hazardous waste defined in LAC 33:V.4903. Analytical results of TCLP extractions conducted on both grab samples (for volatiles) and composite samples (for other constituents) of the residual solids generated by the NORF during Norco's Delisting Demonstration, are presented in Appendix F-1 and summarized in Tables 2 and 3.

**F-4 PERTINENT DATA AND DISCUSSION OF CRITERION FOR LISTING OF THE WASTE AS HAZARDOUS, WHERE THE DEMONSTRATION IS BASED ON THE FACTORS IN LAC 33:V.4907.A.3 [LAC 33: V. 105 M. 7. g.]**

The administrative authority shall list a solid waste as a hazardous waste upon determining that the solid waste meets one of the following criteria: (3) It contains any of the toxic constituents listed in LAC 33: V. 3105. Table 1, and after considering the following factors, the administrative authority concludes that the waste is capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed:

As previously documented in Section F-1, TCLP extract of NORF's residual solids, resulting from recycling of oily process material solids by thermal desorption, were demonstrated to

contain only two detectable Appendix IX organic constituents of concern. However, the presence of Appendix IX organic constituents of concern at concentrations below levels of regulatory concern does not warrant retaining residual solids processed through the NORF as a hazardous waste.

Norco acknowledges the presence of the following inorganic constituents of concern in residual solids resulting from recycling of oily process material by thermal desorption at the NORF:

- arsenic (sample # 4);
- barium (samples # 1, 2, 3, and 4);
- mercury (sample # 1);
- nickel (samples # 2 and 3);
- selenium (samples # 2 and 4);
- silver (sample # 1); and
- zinc (sample # 2).

Stabilization (where appropriate) with hydrated lime has shown to reduce the amount of inorganic constituents in leachate from these materials to levels below regulatory concern and to levels below anticipated delisting criteria. However, the presence of inorganic constituents of concern at concentrations below levels of regulatory concern, does not warrant retaining the residual solids generated at the NORF as a hazardous waste.

Analytical results of TCLP extractions for composite samples of the NORF's residual solids, demonstrate the immobility of Appendix IX inorganic constituents of concern. All TCLP inorganic constituents of concern exhibited leaching characteristics well below concentration levels of regulatory concern. Analytical results of TCLP extractions conducted on both grab samples (for volatiles) and composite samples (for other constituents) of the residual solids generated by the NORF during Norco's Delisting Demonstration, are presented in Appendix F-1 and summarized in Tables 2 and 3. As indicated in Table 3, where appropriate, stabilization with hydrated lime effectively reduces the amount of inorganic constituents available for leaching into the environment below levels of regulatory concern and below levels of

anticipated delisting criteria.

**(a) The nature of the toxicity presented by the constituent.**

Oily process materials (F037) are listed as hazardous in LAC 33: V. 4901. G. Table 6 due to the possible presence of lead, hexavalent chromium, benzene, benzo(a)pyrene and chrysene. Analytical results obtained during Norco's Delisting Demonstration for extractable constituents of concern documented the removal of benzene, benzo(a)pyrene and chrysene to concentrations below levels of regulatory concern. The presence of Appendix IX organic constituents of concern [carbon disulfide and diethylphthalate] at concentrations below levels of regulatory concern does not warrant the discussion of the potential toxicity of these Appendix IX constituents. However, lead and chromium may not be removed or recycled (unless associated with the oil and/or water recycled back to the Norco Refinery) by Norco's thermal desorption recycling system. Therefore, the nature of toxicology for these constituents is included in this petition.

Lead is a naturally occurring element with residual concentrations being highly dependent on the soil type and associated bedrock. Higher lead concentrations in soils derived from quartz mica schist or black shales could range as high as 200 ppm. However the average soil concentration is around 10 ppm. Lead and most lead compounds are classified as Class B2 carcinogens - Probable Human Carcinogens, resulting from sufficient evidence of carcinogenicity in experimental animals and inadequate evidence of carcinogenicity in humans. Lead is stored in the body in bone, kidney, and liver. The major adverse effects in humans caused by lead exposure include alterations in the hematopoietic and nervous systems. The toxic effects are generally related to the concentration of this metal in blood. Mutagenicity cannot be determined from short-term tests due to cellular toxicity.

Chromium is widely distributed in the environment in soils, bedrock, sediments and biological

materials. The range of chromium in native soils and bedrock is from 1 to 1,000 ppm with a mean concentration of 100 ppm. Chromium is an essential element for animals and has been demonstrated to be beneficial to plants. Chromium is found at a number of valence states, with the most stable forms including trivalent and hexavalent. The other forms rapidly convert to trivalent chromium. Under aerobic acid conditions, the trivalent form is typically considered inert in soils. The LDEQ and EPA have classified hexavalent chromium as Class A Human Carcinogen for inhalation exposure. Chromium III has not yet been classified. Chronic inhalation exposure of chromium can cause respiratory system damage. Chromium is a sensitizing agent producing allergic skin reactions or asthma. Chromium is absorbed through the gastrointestinal tract, the lungs and through the skin by diffusion. Once absorbed, chromium is transported by binding to proteins in the blood. Chromium is cleared rapidly from the blood and slowly from the tissues. Chromium is distributed to the liver, spleen, bone marrow, lung and kidney.

**(b) The concentration of the constituent in the waste.**

Lead and chromium were not detected in TCLP extracts conducted on residual solids generated at the NORF as part of the Delisting Demonstration. These detection limits were well below established delisting criteria, and do not warrant regulatory concern.

**(c) The potential of the constituent or any toxic degradation product of the constituent to migrate from the waste into the environment under the types of improper management considered in LAC 33:V.4907.A.3.g.**

The toxic constituents could enter the environment under certain mismanagement procedures, but only associated with the NORF's residual solids at concentrations below regulatory concern. Therefore, the potential for migration of toxic constituents into groundwater or surface water is not of regulatory concern.

- (d) The persistence of the constituent or any toxic degradation product of the constituent.**

The toxic constituents of concern, lead and chromium, are persistent and not subject to degradation. Therefore, no potential exists for the formation of toxic degradation products. Additionally, the presence of lead or chromium, at concentrations below established delisting criteria, does not warrant regulatory concern.

- (e) The potential for the constituent or any toxic degradation product of the constituent to degrade into non-harmful constituents and the rate of degradation.**

The toxic constituents, lead and chromium, will not degrade.

- (f) The degree to which the constituent or any degradation product of the constituent bioaccumulates in ecosystems.**

Lead is found in the environment in a number of organic and inorganic forms that affects its fate. In soils, the mobility and environmental fate of lead depends on the moisture content, soil pH, organic matter content, and the concentration of calcium and phosphates. The fate of lead entering natural waters is precipitation to sediments as carbonates or hydroxides. Lead has been shown to bioaccumulate in plants and wildlife species but biomagnification has not been shown to be significant.

Trivalent chromium strongly absorbs to colloidal complexes and organic particulate matter. However, hexavalent chromium has low adsorptive properties and is considered rather mobile in soils, groundwater and surface water. Chromium has been shown to bioaccumulate in plants

and wildlife species but biomagnification has not been shown to be significant.  
Bioaccumulation is typically higher for trivalent chromium than for hexavalent chromium.

- (g) The plausible types of improper management to which the waste could be subjected.**

Plausible types of mismanagement that could occur if the NORF's residual solids were managed off-site include:

- failure to cover when transporting resulting in loss of fine, airborne particles; and
- a spill resulting from a transportation accident and improper management of the land disposal operation by the operator.

- (h) The quantities of the waste generated at individual generation sites or on a regional or national basis.**

The petitioner has no way to ascertain rate of generation, for residual solid from the thermal desorption recycling of oily process materials, on either a national or regional basis.

- (i) The nature and severity of the human health and environmental damage that has occurred as a result of the improper management of wastes containing the constituent.**

The petitioner is not aware of any instances of mismanagement of oily process material, and therefore, cannot comment on whether any human health or environmental damage has been caused by such action.

- (j) Action taken by other government agencies or regulatory programs based on the health or environmental hazard posed by the waste or waste constituents.**

The petitioner is not aware of any other regulatory program that specifically affects oily process material. However, lead and hexavalent chromium are regulated under several programs promulgated by the LDEQ and EPA.

- (k) Such other factors as may be appropriate.**

The petitioner is not aware of any appropriate additional factors.

Tables

**Norco Dellisting Demonstration**  
**Norco, Louisiana**

[illegible]

**Table 2**  
**Summary of Analytical Results**  
**Initial Four Sampling Events**  
**NORCO Delisting Demonstration**

Sample - Date Collected	Sample # 1 BP #1 - 8/11/98			Sample # 2 BP #2 - 1/27/99			Sample # 3 Norco # 1 - 4/27/99		Sample # 4 Norco # 2 - 5/12/99			
	Resid. Solid		OPM	Resid. Solid		OPM	Resid. Solid		OPM	Resid. Solid		OPM
	Solid	Leachate	Solid	Leachate	Solid	Leachate	Solid	Leachate	Solid	Leachate	Solid	
Analyte	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)	(mg/kg)	(mg/l)	(mg/kg)	
Volatile Organic Compounds												
Benzene	3.04	ND<0.0500	582	ND<0.0500	334	ND<0.0500	1,270	ND<0.0500	73.7			
Carbon disulfide	ND<0.625	0.283	ND<50	0.0819	ND<18.8	0.336	ND<125	0.0572	ND<0.625			
Ethylbenzene	ND<0.625	ND<0.0500	771	ND<0.0500	168	ND<0.0500	514	ND<0.0500	33			
Styrene	ND<0.625	ND<0.0500	54.5	ND<0.0500	ND<18.8	ND<0.0500	763	ND<0.0500	34			
Toluene	0.885 J	ND<0.0500	614	ND<0.0500	293	ND<0.0500	2,370	ND<0.0500	152			
Xylene (total)	0.798	ND<0.0500	5,630	ND<0.0500	1,270	ND<0.0500	2,090	ND<0.0500	160			
Semivolatile Organic Compounds												
Acenaphthene	ND<1.33	ND<0.0400	NA	ND<0.0400	23.6	ND<0.0400	18.5	ND<0.0400	110			
Anthracene	ND<1.33	ND<0.0400	ND<200	ND<0.0400	ND<16.7	ND<0.0400	10.1	ND<0.0400	ND<100			
Chrysene	ND<1.33	ND<0.0400	ND<200	ND<0.0400	25.5	ND<0.0400	10.8	ND<0.0400	ND<100			
Diethylphthalate	ND<1.33	ND<0.0400	ND<200	0.0756 U	ND<16.7	ND<0.0400	ND<6.66	ND<0.0400	ND<100			
Fluorene	ND<1.33	ND<0.0400	ND<200	ND<0.0400	31.5	ND<0.0400	20.1	ND<0.0400	128			
Indene	ND<1.33UJ	ND<0.0100	ND<200UJ	ND<0.0100	ND<16.7	ND<0.0100	360	ND<0.0400	375			
Methyl chrysene	ND<1.33	ND<0.0100	ND<200	ND<0.0100	119	ND<0.0100	53.7	ND<0.0400	ND<100			
1-Methylnaphthalene	2.94	ND<0.0100	554	ND<0.0100	300	ND<0.0100	283	ND<0.0400	877			
2-Methylnaphthalene	2.95	ND<0.0400	NA	ND<0.0400	399	ND<0.0400	383	ND<0.0400	833			
Naphthalene	2.74	ND<0.0400	369	ND<0.0400	191	ND<0.0400	528	ND<0.0400	601			
Phenanthrene	ND<1.33	ND<0.0400	ND<200	ND<0.0400	79.1	ND<0.0400	38.8	ND<0.0400	173			
Pyrene	ND<1.33	ND<0.0400	ND<200	ND<0.0400	31.3	ND<0.0400	11.2	ND<0.0400	ND<100			
Metals												
Antimony	61.5 J	0.706	153 J	0.357	36.3 J	ND<0.080	ND<6.00	ND<0.080	ND<6.00			
Arsenic	5.41	ND<0.01	13.5	ND<1.00	10.3 J	ND<0.010	7.85	0.0182 J	15.4			
Barium	ND<20 UJ	1.85 J	626 J	12.3	588	0.870 J	371	1.280 J	1710 J			
Cadmium	ND<0.5 UJ	ND<0.005UJ	1.28 J	ND<0.100	ND<0.5 UJ	ND<0.005 UJ	ND<0.5 UJ	ND<0.005UJ	2.01			
Chromium	82.7 J	ND<0.01	220 J	ND<0.500	125	ND<0.010	62.3	ND<0.010	108			
Cobalt	6.41	ND<0.050	14.8	ND<0.500	7.03 J	ND<0.050	11.2	ND<0.050UJ	20.1			
Copper	26.7 J	ND<0.025	NA	ND<0.500	44.4	ND<0.025UJ	123	ND<0.025UJ	191			
Lead	11.9	ND<0.003	41	ND<0.500	30.8	ND<0.003	44.2	ND<0.003UJ	154			
Mercury	0.139 J	0.0004	ND<0.396R	ND<0.0002	2.02	ND<0.0002	6.93	ND<0.0002	18.6			
Nickel	24.1	ND<0.04	52.5	1.41 J	43.9	0.0753 J	727	ND<0.040	498 J			
Selenium	2.22	0.0111 J	5.22	ND<0.200	3.05 J	ND<0.025	ND<25	0.0198 J	3.82 J			
Silver	ND<1 UJ	0.0207	2.39 J	ND<0.500	ND<1	ND<0.010UJ	16.6 J	ND<0.010UJ	12.2 J			
Thallium	ND<1 UJ	ND<0.01 UJ	NA	ND<0.500	ND<1	ND<0.010UJ	ND<1.00	ND<0.01 UJ	ND<1.00			
Tin	2.88	ND<0.02	NA	ND<0.500	ND<2 UJ	ND<0.020UJ	ND<2 UJ	ND<0.020 UJ	ND<2.00			
Vanadium	11.4	ND<0.05	23	ND<0.500	15.0	ND<0.050UJ	26.5	ND<0.050	83.8			
Zinc	372 J	ND<0.02	846 J	7.71 J	473	ND<0.020	1,880	ND<0.020	2130 J			
Others (on Residual Solid Only)												
Flashpoint (deg.C)	73	NA	NA	76	NA	65.0	NA	40.0	NA			
Oil & Grease (mg/kg)	2540	NA	NA	1210	NA	3660	NA	662	NA			
pH	12.2	NA	NA	11.8	NA	11.0	NA	11.5	NA			
Total Cyanide (mg/kg)	1.14 J	NA	NA	ND<1 UJ	NA	12.6 J	NA	ND<1.00 R	NA			
React. Cyanide(mg/kg)	ND<25.0 R	NA	NA	ND<25.0	NA	ND<25.0 R	NA	ND<25.0 R	NA			
React. Sulfide (mg/kg)	ND<50.0	NA	NA	ND<50.0	NA	ND<50.0	NA	ND<50.0	NA			
Notes:												
(1) Only those analytes detected in at least one of the samples (Residual Solid - leachate or Only Process Material - solid) are listed in this summary.												
(2) Pesticides, PCBs, Organophosphate pesticides, Herbicides, Dioxans, and Furans were not detected at the MDL in the residual solid sample [total and leachate] for the First Sample												
NA = Not Analyzed												

10/23/00 - 10:03 AM

Table 3  
Summary of Results - Stabilization Demonstration  
Norco Oil Recovery Facility - Norco Louisiana

Lab ID	Extraction #	Detection Limit (mg/L)	B-RS-U-3 Composite 20200394	B-RS-SHL-3 Composite 20200395	20200396A 2	20200396B 3	20200396C 4	20200396D 5	20200396E 6	20200396F 7	20200396G 8	20200396H 9	20200396I 10	20200396J 11	20200396K 12	20200396L 13	20200396M 14
antimony	0.43	0.08	ND-0.0100	0.237	0.198	0.185	0.133	0.107	0.0899	0.0761	0.0618	ND-0.060	ND-0.080				
arsenic	0.01	0.01	ND-0.0100	0.308													
barium	0.2	0.2	4.79	2.93													
beryllium	0.005	0.005	ND-0.00500	0.126													
cadmium	0.005	0.005	ND-0.00500	0.767													
chromium (total)	0.01	0.01	ND-0.0100	0.407													
cobalt	0.05	0.05	ND-0.0500	0.481													
copper	0.025	0.025	ND-0.0250	0.157													
lead	0.003	0.003	ND-0.00300	0.0532													
mercury	0.0002	0.0002	ND-0.000200	0.0532													
nickel	0.04	0.04	ND-0.0400	1.84													
selenium	0.005	0.005	0.0165	0.0581													
silver	0.01	0.01	ND-0.0100	0.0539													
thallium	0.01	0.01	ND-0.0100	0.0125													
tin	0.02	0.02	ND-0.0200	0.748													
vanadium	0.05	0.05	ND-0.0500	ND-0.0500													
zinc	0.02	0.02	ND-0.0200	53.2													
Lab ID	Extraction #	Detection Limit (mg/L)	B-RS-U-4 Composite 20200406	B-RS-SSO-F-4 Composite 20200407	20200407A 2	20200407B 3	20200407C 4	20200407D 5	20200407E 6	20200407F 7	20200407G 8	20200407H 9	20200407I 10				
antimony	0.898	0.0898	0.0112	0.439	0.49	0.35	0.177	0.121	0.108	0.0642	0.0914	0.074	ND-0.080				
arsenic	0.0112	0.0112	0.0337	4.01													
beryllium	1.2	1.2	ND-0.00500	ND-0.00500													
cadmium	0.005	0.005	0.0197	0.175													
chromium (total)	0.011	0.011	ND-0.0100	0.0094													
cobalt	0.05	0.05	ND-0.0500	0.0094													
copper	0.025	0.025	ND-0.0250	0.614													
lead	0.003	0.003	ND-0.00300	0.004													
mercury	0.0002	0.0002	ND-0.000200	0.004													
nickel	0.04	0.04	ND-0.0400	0.004													
selenium	0.005	0.005	0.0045	0.0045													
silver	0.021	0.021	ND-0.0100	0.021													
thallium	0.0132	0.0132	ND-0.0100	0.0132													
tin	0.02	0.02	ND-0.0200	0.02													
vanadium	0.05	0.05	ND-0.0500	0.05													
zinc	0.0653	0.0653	0.0653	14.9													
Lab ID	Extraction #	Detection Limit (mg/L)	B-RS-U-5 Composite 20200410	B-RS-SSO-P-5 Composite 20200411	20200411A 2	20200411B 3	20200411C 4	20200411D 5	20200411E 6	20200411F 7	20200411G 8	20200411H 9	20200411I 10				
antimony	1.38	0.393	0.0327	0.393	0.511	0.335	0.151	0.122	0.0623	0.062	0.0377	0.071	ND-0.080				
arsenic	0.0327	0.0327	0.0478	0.0478													
beryllium	1.25	1.25	ND-0.00500	ND-0.00500													
cadmium	0.005	0.005	0.0332	0.0332													
chromium (total)	0.01	0.01	ND-0.0100	0.01													
cobalt	0.02	0.02	ND-0.0200	0.02													
copper	0.025	0.025	ND-0.0250	0.025													
lead	0.003	0.003	ND-0.00300	0.003													
mercury	0.0002	0.0002	ND-0.000200	0.0002													
nickel	0.04	0.04	ND-0.0400	0.04													
selenium	0.005	0.005	0.0045	0.0045													
silver	0.021	0.021	ND-0.0100	0.021													
thallium	0.0132	0.0132	ND-0.0100	0.0132													
tin	0.02	0.02	ND-0.0200	0.02													
vanadium	0.05	0.05	ND-0.0500	0.05													
zinc	0.0653	0.0653	0.0653	15.9													

All Results are in mg/L

Table 4  
Basis for Waste Listing, Physical Form, and Range of Percent Solids  
for  
Listed Wastes Processed at the NORF

EPA Waste Code	Description	Basis for Listing	Physical Form	Range Percent Solids
F037	Primary sludge from gravitational separation of oil/water/solids	lead, chromium, benzene, benzo(a)pyrene, and chrysene	sludge	5 - 80
F038	Secondary (emulsified) sludge from the gravitational separation of oil/water/solids	lead, chromium, benzene, benzo(a)pyrene, and chrysene	sludge	5 - 80
K048	Dissolved Air Flotation (DAF) float (sludge)	lead and hexavalent chromium	sludge	5 - 80
K049	Slop oil emulsion solids	lead and hexavalent chromium	sludge	5 - 80
K050	Heat exchanger bundle cleaning solids	lead and hexavalent chromium	sludge	5 - 80
K051	API separator sludge	lead and hexavalent chromium	sludge	5 - 80
K169	Crude oil storage tank sediment from petroleum refining operations	benz(a)anthracene, benzene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, ethylbenzene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, pyrene, toluene, and xylene	sludge	5 - 80
K170	Clarified slurry oil tank sediment and/or in-line filter/separation solids from petroleum refining operations	benz(a)anthracene, benzene, benzo(g,h,i)perylene, chrysene, ethylbenzene, fluorene, naphthalene, phenanthrene, pyrene, toluene, and xylene	sludge	5 - 80
K171	Spent hydrotreating catalyst from petroleum refining operations	benzene, chrysene, ethylbenzene, naphthalene, phenanthrene, pyrene, toluene, arsenic, nickel, vanadium, and reactive sulfides	sludge	5 - 80
K172	Spent hydrorefining catalyst from petroleum refining operations	benzene, ethylbenzene, toluene, xylenes, antimony, arsenic, nickel, vanadium, and reactive sulfides	sludge	5 - 80

**TABLE 5**  
**Client List -Norco Oil Recovery Facility**  
**Philip Services Corporation**  
**Norco, Louisiana**

**Amerada Hess Corporation – Purvis Refinery**  
EPA ID# MSD079461406  
SIC 2911  
P.O. Box 425  
U.S. Highway #11  
Purvis, MS 39475

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**Tosco Alliance Refinery – formerly B.P Oil Alliance Refinery**  
EPA ID# LAD056024391  
SIC 2911  
15551 LA Highway 23 South  
Belle Chase, LA 70037

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**Equilon Enterprises LLC – Bakersfield Refining Co.**  
EPA ID# CAD099457087 / CAD982052094  
Sic 2911  
P.O. Box 1476  
Bakersfield, CA 93302

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**Exxon Company, USA**  
EPA ID# LAD062662887  
SIC 2911  
P.O. Box 91012  
Baton Rouge, LA 70821

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**Exxon Chemical**  
EPA ID# LAD000812818  
  
P.O. Box 91012  
Baton Rouge, LA 70821

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**Cenac Towing**  
EPA ID# LAR000021212  
  
141 Bayou Dularge Rd.  
Houma, LA 70363

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**ES&H / DEQ**

1730 Coteau Rd.  
Houma, LA 70364

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**L&L Oil Company**

124 N. Doucet  
Golden Meadow, LA 70357

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**Giant Refining – Bloomfield**  
EPA ID# NMD089416416  
SIC 2911  
County Rd # 4990  
Bloomfield, New Mexico 87413

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**Louisiana Department of Environmental Quality**  
Environmental Radiation Lab  
4845 Jamestown Ave. Suite 102  
Baton Rouge, LA 70808

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**Montana Refining Company**  
EPA ID# MTD000475194  
SIC 2911  
1900 10<sup>th</sup> St. NE  
Great Falls, MT 59404

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**Marathon Ashland Pipeline**

Highway 23 South @ Marathon Lane  
Venice, LA 70091

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**Marathon Ashland Pipeline**  
EPA ID# TXD000741801

431 N. Preston Rd.  
Pasadena, TX, 77503

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**Murphy Oil, USA**  
EPA ID# LAD008058471  
SIC 2911  
2500 E. St. Bernard Highway  
Meraux, LA 70075

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**Reclaim Environmental**  
EPA ID# TXD490303484

3701 N. Grove St.  
Fort Worth, TX 76106

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**Orion Refining Company**  
EPA ID# LAD000225862  
SIC 2911  
14902 River Rd.  
New Sarpy, LA 70078

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**Chemical - Alabama Shell**  
EPA ID# ALD020852422  
SCI 2911  
Highway 158 East  
Saraland, Alabama 36571

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**Motiva Enterprises - Convent Refinery**  
EPA ID# LAD065485146  
SIC 2911  
LA Highway 44 & 70  
Convent, LA 70723

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**Texaco Pipeline**  
EPA ID# TXD000728824

1825 Homills  
Port Arthur, TX 77640

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**U.S. Filter**  
EPA ID# LAR000002030

1122 U.S. Highway 190 W  
Port Allen, LA 70767

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**Valero Refining Company**

EPA ID# LAD081407850

SIC Code 2911

Highway 150 South

Krotz Springs, LA 70750

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**Western Gas Resources – Toca Plant**

EPA ID# LAD008194711

2404 Bayou Rd.

St. Bernard, LA 70085

**Table 6**  
**Hazardous Wastes That Have Been Generated at Norco Refinery**  
**Norco, Louisiana**

**RCRA CODES CURRENTLY LISTED ON HW-1 FORM WITH LADEQ (update 8/23/2000 form)**  
**Ownership change from Shell Norco Refining Company to Motiva Enterprises LLC Effective 10/1/99**

EPA id # LAD008186578  
 Facility Owner MOTIVA ENTERPRISES LLC  
 Facility Name Norco Refinery  
 Phys address 15536 River Road, Norco LA 70079  
 Mail address P.O. Box 10, Norco LA 70079

**CHARACTERISTIC WASTES -- "D" CODE**

D001 IGNITABLE  
 D002 CORROSIVE  
 D003 REACTIVE  
 D004 Arsenic (Toxicity Characteristic Waste)  
 D005 Barium  
 D006 Cadmium  
 D007 Chromium  
 D008 Lead  
 D009 Mercury  
 D010 Selenium  
 D011 Silver  
 D018 Benzene  
 D021 Chlorobenzene  
 D027 1,4-Dichlorobenzene  
 D035 Methyl Ethyl Ketone  
 D039 Tetrachloroethylene  
 D040 Trichloroethylene

**LISTED HAZARDOUS WASTES FROM NONSPECIFIC SOURCES -- "F" CODE**

F001 Spent halogenated solvents used in degreasing  
 F002 Spent halogenated solvents..  
 F003 Spent non-halogenated solvents...xylene, acet..  
 F005 Spent non-halogenated solvents...toluene, MEK, Bz.  
 F037 Petro.refinery primary oil/water/solids sludge  
 F038 Petro.refinery secondary oil sludge (DAF sludge)

**LISTED SPECIFIC SOURCE WASTES -- "K" CODE**

K048 Dissolved Air Flotation (DAF) float from petro.ref  
 K049 Slop oil emulsion solids from petroleum refining  
 K050 Heat exch. bundle cleaning sludge, petrol. ref  
 K051 API separator sludge from petroleum refining  
 K052 Tank bottom (lead) from petroleum refining  
 K169 Crude oil storage tank sediment from petroleum refining  
 K170 Clarified slurry oil storage tank sediment... petro. Ref.  
 K171 Spent hydrotreating catalyst from petroleum refining...  
 K172 Spent hydrorefining catalyst from petroleum refining...

**LISTED ACUTE HAZARDOUS WASTES -- "P" CODE**

P012 Arsenic Oxide As2O3 (CAS #1327-53-3)  
 P088 Endothel (CAS #145-73-3)  
 P104 Silver cyanide (CAS# 508-84-9)  
 P120 Vanadium Pentoxide (CAS# 1314-62-1)

**LISTED TOXIC WASTES -- "U" CODE**

U002 Acetone (CAS #67-64-1)  
 U019 Benzene (CAS #71-43-2)  
 U026 Naphthalenamine, N,N'-bis(2-chloroethyl)- (CAS# 494-03-1)  
 U052 Cresols (CAS #1319-77-3)  
 U080 Methylene chloride (CAS #75-09-2)  
 U151 Mercury  
 U154 Methanol (CAS #67-56-1)  
 U165 Naphthalene (CAS #91-20-3)  
 U220 Toluene (CAS #108-88-3)  
 U239 Xylene (CAS #1330-20-7)

Table 7  
Non-Hazardous Solid Wastes Generated at Norco Refinery  
Norco, Louisiana

<b>NORCO REFINERY, MOTIVA ENTERPRISES LLC</b> <b>SOLID WASTE STREAM NUMBERS</b> <b>(NOTIFICATION NUMBER GD-089-0359)</b>	
<b>SOLID WASTE #</b>	<b>WASTE NAME</b>
0359- 003	Ash/Incinerator and Boiler
0359- 006	Blasting Media
0359- 008	Carbon/Carbon Black/Coke/Coal
0359- 009	Catalyst/Cat Fines
0359- 012	Contaminated Concrete and Insulation
0359- 014	Contaminated Sand/Soil
0359- 016	Desiccant
0359- 019	Fire Brick/Furnace Brick/ Reactor Brick
0359- 023	Insulation/Non-Asbestos
0359- 025	Lime
0359- 027	Off Spec./Spent Materials
0359- 030	Plant Maintenance Debris, Contaminated Articles
0359- 034	Treated Woodwaste
0359- 035	Vessel, Exchanger, Tank, and Pipe Scales
0359- 036	Cooling Tower Basin Sludge
0359- 037	Impoundment Sludges/Solids
0359- 039	Process Unit Sludges
0359- 042	Wastewater Treatment Plant Sludges
0359- 044	Filter Media/Filters

**Table 8**  
**Waste Treatment and Waste Management Units**  
**At the Norco Refinery,**  
**Norco, Louisiana**

<b>Item# Fig. 11</b>	<b>Facility</b>	<b>Description, Permit Number, Status</b>
1	SWIB/AB & Conveyance System	Permitted wastewater treatment system, non-hazardous. DEQ Solid Waste Permit GD-089-0359/P-0268 Status: Active
2	Closed Landfill	Permitted Type I Industrial Waste Landfill, non-hazardous. DEQ Solid Waste Permit GD-089-0359/P-0114 Status: In post-closure since 12/97.
3	New landfill	Permitted Type I Industrial Waste Landfill, non-hazardous. DEQ Solid Waste Permit GD-089-0359/P0310 Status: Active since 12/96.
4	Paint Waste Satellite	Satellite accumulation area for paint waste. Permit not required. Status: Active
5	Container Storage Area	Secure area to store rolloff boxes awaiting shipment. This is the area that stores the residual solid material generated at the NORF. Permit not required. Status: Active
6	<90 Day Drum Storage	Secure area to store drums of waste awaiting shipment. Permit not required. Status: Active
7	Norco Oil Recovery Facility (NORF)	Facility that recovers oil and removes water from oily sludges and oil-bearing secondary materials. This facility generates the residual solid material that is the subject of this delisting petition. Permit not required (exempt recycling facility, LAC 33.V.4115) Status: Active
8	Heat Exchanger Bundle Cleaning Area	Maintenance area where heat exchanger bundles are hydroblasted (cleaned). Bundle cleaning sludge is captured in a sump. The sludge is oil-bearing secondary material that is processed for oil recovery at the NORF. Permit not required Status: Active

**Table 9**  
**Sample Identification Numbers, Sampling Times, Laboratory Identification Numbers, and Analyses Conducted**

**Norco Delisting Demonstration**  
**Norco, Louisiana**

Delisting Sample #	Date Collected	Norco Id #	Time Sampled	Composite ID #	Laboratory ID #	Analytical Parameters
1	9/11/99	B-OPM-1-1	0532	B-OPM-1-1,2,3	OEW-1	Skinner List SVOCs and App IX Metals
		B-OPM-1-2	1125			
		B-OPM-1-3	1745			
		B-OPM-1-2	1125	Grab	OEW-7	Skinner List VOCs
		B-RS-1-1	0605	B-RS-1-1,2,3 Leachate	OEW 2	App. IX SVOCs, pest/PCB, herb, TCDD, and metals; total cyanide and sulfide
		B-RS-1-2	1200			
		B-RS-1-3	1822		OEW-18	Skinner List SVOCs and App IX Metals
		B-RS-1-2	1200	Grab	OEW-4L	Appendix IX VOCs
		B-RS-1-1	0605	B-RS-1-1,2,3	OEW-8	App. IX SVOCs, pest/PCB, herb, TCDD, and metals; pH, I, O/g, reactive cyanide and sulfide, total cyanide and sulfide
		B-RS-1-2	1200			
		B-RS-1-3	1822			
		B-RS-1-2	1200	Grab	OEW-4	ApplX & Sk. Lst Total VOC
		B-FB-1-1	0530	B-FB-1-1,2,3	OEW-3	Skinner List SVOCs and App IX Metals
		B-FB-1-2	1120			
		B-FB-1-3	1722			
		B-FB-1-2	0530	Grab	OEW-5	Skinner List VOCs
		B-TB-1	NA	Grrab	OEW-006	VOCs and metals
2	1/27/99	B-OPM-2-1	0502	B-OPM-2-1,2,3	QCY-001	SVOCs and metals
		B-OPM-2-2	1135			
		B-OPM-2-3	1719			
		B-OPM-2-2	1135	Grab	QCY-015	VOCs
		B-RS-2-1	0538	B-RS-2-1,2,3 Leachate	QCY-003	SVOCs and metals
		B-RS-2-2	1210		QCY-004, MS	
		B-RS-2-3	1758		QCY-005 MSD	
		B-RS-2-2	1210	B-RS-2-2 Leachate	QCY-012, QCY-013MS QCY-014 MSD	VOCs
		B-RS-2-1	0538	B-RS-2-1,2,3	QCY-006	pH, I, O/g, reactive cyanide reactive sulfide, and total cyanide
		B-RS-2-2	1210		QCY-007 DUP	
		B-RS-2-3	1758		QCY-008 MS QCY-009 MSD	
		B-FB-2-1	0457	B-FB-2-1,2,3	QCY-002	SVOCs and metals
		B-FB-2-2	1131			
		B-FB-2-3	1715			
		B-FB-2-2	1131	Grab	QCY-010	VOCs
		B-TB-2	NA	Grab	QCY-016	VOCs and metals

**Table 9**  
**Sample Identification Numbers, Sampling Times, Laboratory Identification Numbers, and Analyses Conducted**

**Norco Delisting Demonstration**  
**Norco, Louisiana**

Delisting Sample #	Date Collected	Norco Id #	Time Sampled	Composite ID #	Laboratory ID #	Analytical Parameters
3	4/27/99	N-OPM-1-1	0534	N-OPM-1-1,2,3	RQM-001	SVOCs and metals
		N-OPM-1-2	1202			
		N-OPM-1-3	1805			
		N-OPM-1-2	1202	Grab	RQM-002	VOCs
		N-RS-1-1	0603	N-RS-1-1,2,3 Leachate	RQM-003	SVOCs and metals
		N-RS-1-2	1238		RQM-004 MS	
		N-RS-1-3	1842		RQM-005 MSD	
		N-RS-1-2	1238	N-RS-1-2 Leachate	RQM-010 RQM-011 MS RQM-012 MSD	VOCs
		N-RS-1-1	0603	N-RS-1-1,2,3	RQM-006	pH, I, O/g, reactive cyanide reactive sulfide, and total cyanide
		N-RS-1-2	1238		RQM-007 DUP	
		N-RS-1-3	1842		RQM-008 MS RQM-009 MSD	
		N-FB-1-1	0532	N-FB-1-1,2,3	RQM-013	SVOCs and metals
		N-FB-1-2	1158			
		N-FB-1-3	1803			
		N-FB-1-2	1158	Grab	RQM-014	VOCs
		N-TB-1	NA	Grab	RQM-015	VOCs and metals
4	5/12/99	N-OPM-2-1	0535	N-OPM-2-1,2,3	RXM-002	SVOCs and metals
		N-OPM-2-2	1147			
		N-OPM-2-3	1757			
		N-OPM-2-1	0535	N-OPM-2-1,2,3	RXM-001 MS/DUP	SVOCs and metals
		N-OPM-2-2	1147			
		N-OPM-2-3	1757			
		N-OPM-2-2	1147	Grab	RXM-005	VOCs
		N-RS-2-1	0606	N-RS-2-1,2,3 Leachate	RXM-006	SVOCs and metals
		N-RS-2-2	1219		RXM-014 MS	
		N-RS-2-3	1832		RXM-015 MSD	
		N-RS-2-2	1219	N-RS-2-2 Leachate	RXM-008 RXM-012 MS RXM-013 MSD	VOCs
		N-RS-2-1	0606	N-RS-2-1,2,3	RXM-008	pH, I, O/g, reactive cyanide reactive sulfide, and total cyanide
		N-RS-2-2	1219		RXM-009 DUP	
		N-RS-2-3	1832		RXM-010 MS RXM-011 MSD	
		N-FB-2-1	0533	N-FB-1-1,2,3	RXM-001	SVOCs and metals
		N-FB-2-2	1144			
		N-FB-2-3	1755			
		N-FB-2-2	1144	Grab	RXM-004	VOCs
		N-TB-1	NA	Grab	RXM-007	VOCs and metals

**Table 9**  
**Sample Identification Numbers, Sampling Times, Laboratory Identification Numbers, and Analyses Conducted**

**Norco Delisting Demonstration**  
**Norco, Louisiana**

Delisting Sample #	Date Collected	Norco Id #	Time Sampled	Composite ID #	Laboratory ID #	Analytical Parameters
5	7/5-6/00	B-RS-U-3-1	758	B-RS-V-3-1.2.3 Composite	2020394	TCLP *Metals
		B-RS-U-3-2	1405			
		B-RS-U-3-3	749			
	7/6-7/00	B-RS-U-4-1	1535	B-RS-V-4-1.2.3 Composite	2020406	TCLP *Metals
		B-RS-U-4-2	731			
		B-RS-U-4-3	1015			
	7/7/00	B-RS-U-5-1	1302	B-RS-V-5-1.2.3 Composite	2020410	TCLP *Metals
		B-RS-U-5-2	1347			
		B-RS-U-5-3	1435			
	7/5/00	B-RS-SHL-3-1	1007	B-RS-SHL-3-1.2.3 Composite	2020395	EPTOX *Metals
	7/5/00	B-RS-SHL-3-2	1601		2020395A	MEP antimony, nickel
					2020395B	
	7/6/00	B-RS-SHL-3-3	954		2020395C	
					2020395D	
					2020395E	
					2020395F	
					2020395G	
					2020395H	
					2020395I	
					2020395J	MEP nickel**
					2020395K	
					2020395L	
					2020395M	
					2020395N	
	7/6-7/00	B-RS-SSO-F-4-1	1642	B-RS-SSO-F-4-1.2.3 Composite	2020407	EPTOX *Metals
		B-RS-SSO-F-4-2	839		2020407A	MEP antimony, nickel
		B-RS-SSO-F-4-3	1118		2020407B	
					2020407C	
					2020407D	
					2020407E	
					2020407F	
					2020407G	
					2020407H	
					2020407I	

**Table 9**  
**Sample Identification Numbers, Sampling Times, Laboratory Identification Numbers, and Analyses Conducted**

**Norco Delisting Demonstration**  
**Norco, Louisiana**

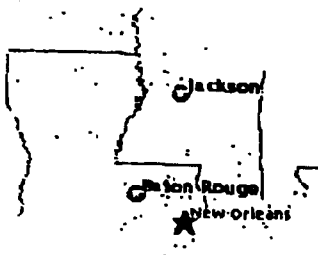
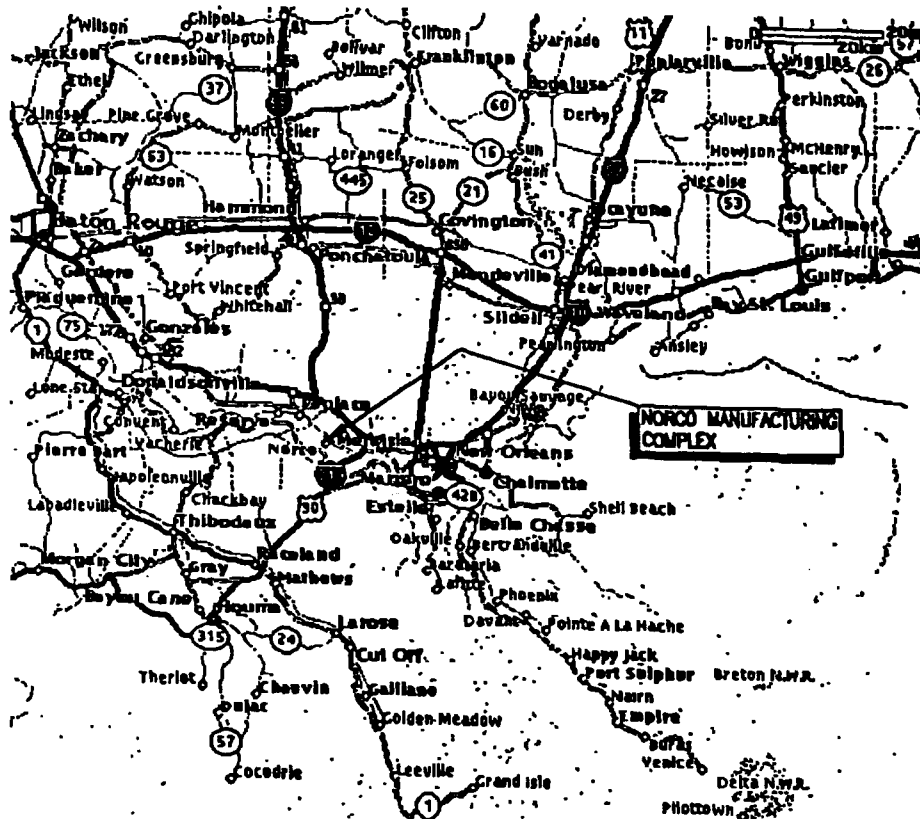
Delisting Sample #	Date Collected	Norco Id #	Time Sampled	Composite ID #	Laboratory ID #	Analytical Parameters
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5	7/7/00	B-RS-SSO-P-5-1	1320	B-RS-SSO-P-5-1.2.3 Composite	2020411	EPTOX *Metals
		B-RS-SSO-P-5-2	1347		2020411A	MEP antimony, nickel
		B-RS-SSO-P-5-3	1435		2020411B	
					2020411C	
					2020411D	
					2020411E	
					2020411F	
					2020411G	
					2020411H	
					2020411I	
	7/5/00	B-FB-3-1	1005	B-FB-3-1.2.3 Composite	2020396	TCLP *Metals
	7/5/00	B-FB-3-2	1558			
	7/6/00	B-FB-3-3	947			
	7/6-7/00	B-FB-4-1	1638	B-FB-4-1.2.3 Composite	2020408	*Metals
		B-FB-4-2	835			
		B-FB-4-3	1113			
	7/7/00	B-FB-5-1	1318	B-FB-5-1.2.3 Composite	2020412	*Metals
		B-FB-5-2	1401			
		B-FB-5-3	1448			
	7/5/00	B-TB-3		Not applicable	2020405	*Metals
	7/6/00	B-TB-4		Not applicable	2020409	*Metals
	7/7/00	B-TB-5		Not applicable	2020413	*Metals

**Table Notes:**

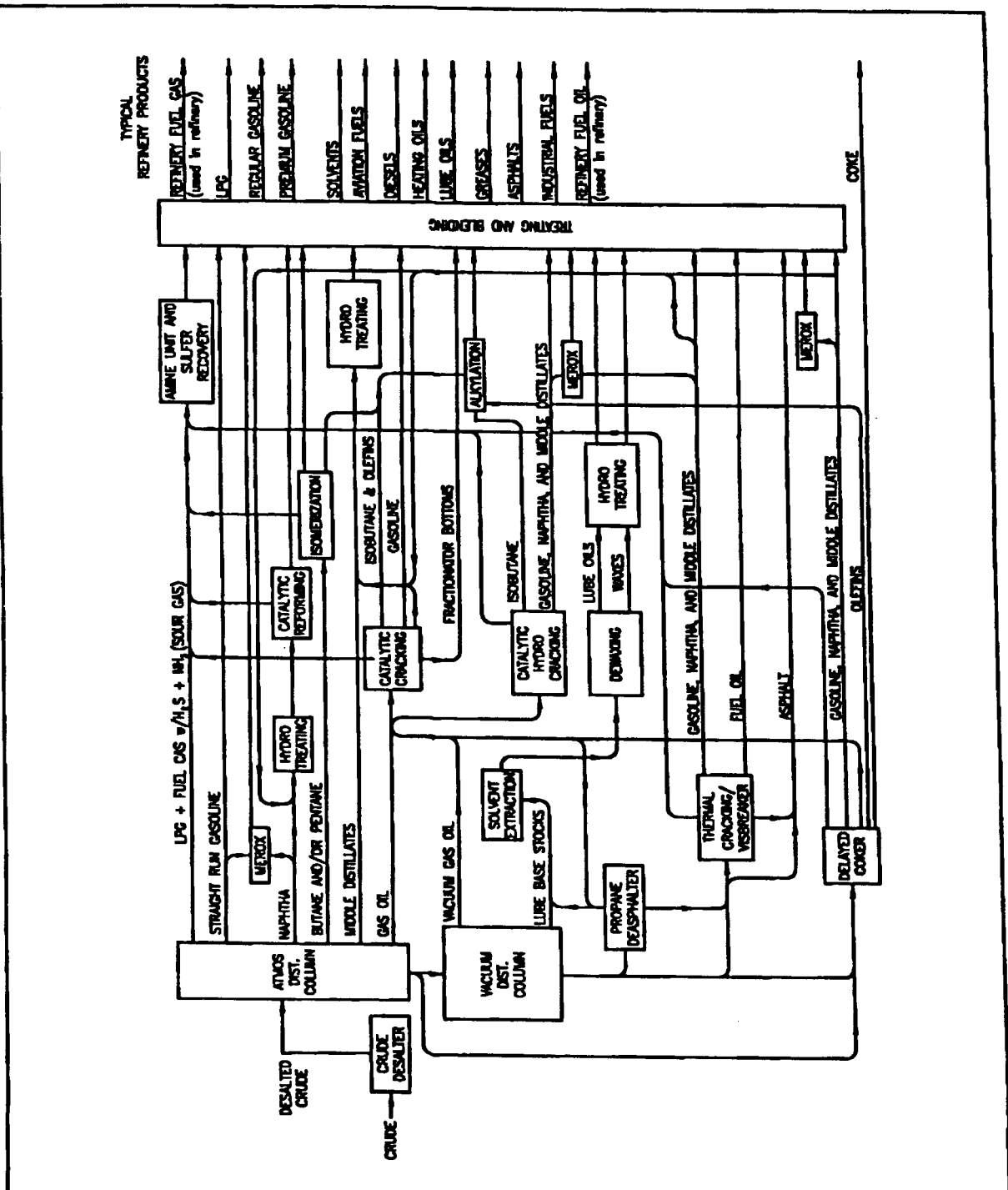
\*Metals included: antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, lead, mercury, nickel, selenium, silver, thallium, tin, vanadium, and zinc.

\*\* Additional multiple extractions were required for nickel since nickel concentrations were increasing following the last three extractions.

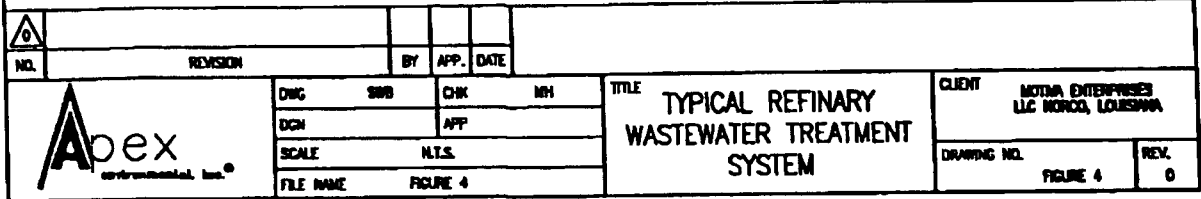


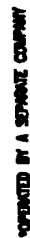
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CLIENT	MOTMA ENTERPRISES LLC NORCO, LOUISIANA																																			
DRAWING NO.	FIGURE 1																																			
REV.	0																																			





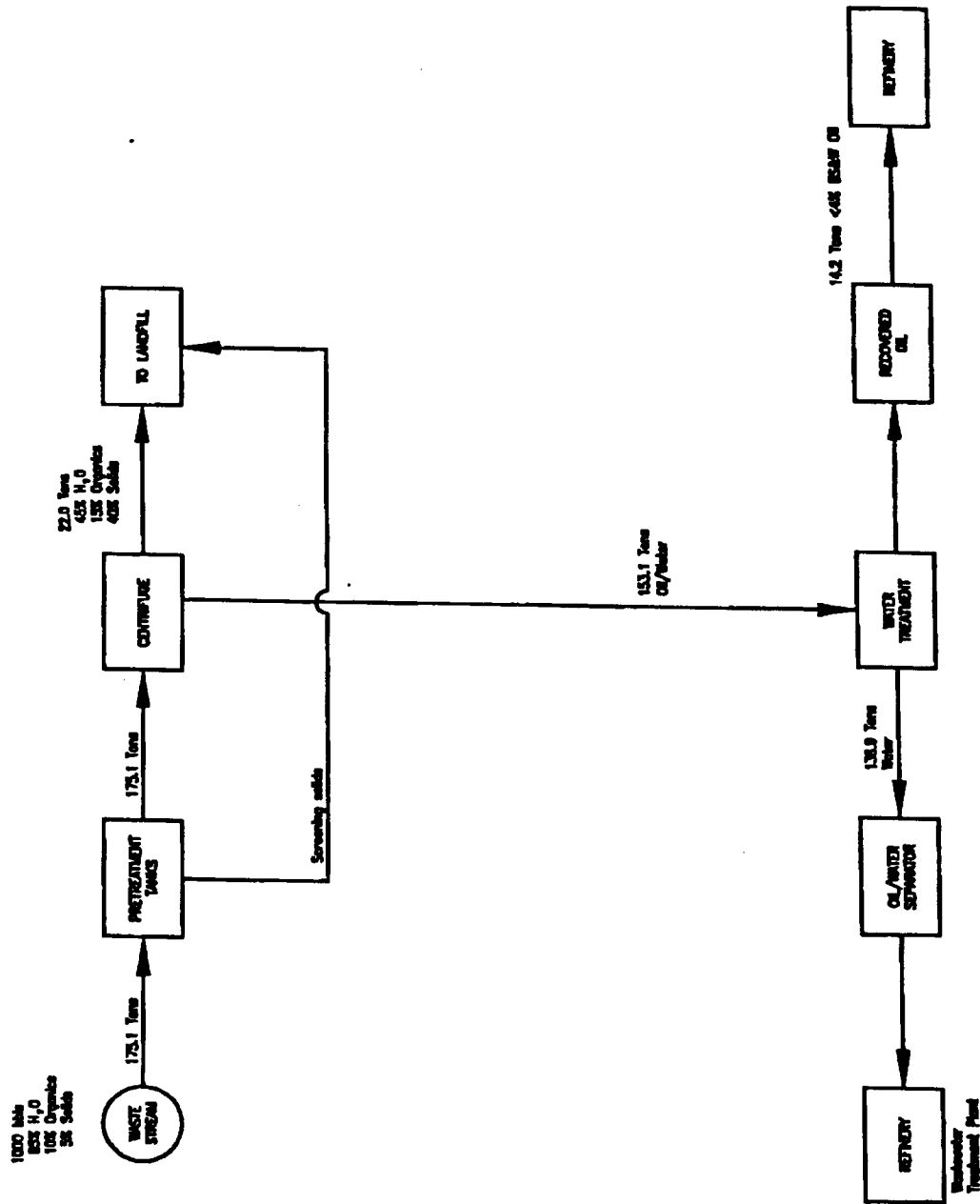
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	DWG	SWB	CHK	MH			
	DGN		APP				
	SCALE	N.T.S.					
	FILE NAME	FIGURE 3					
						<b>DRAWING NO.</b> FIGURE 3	<b>REV.</b> 0



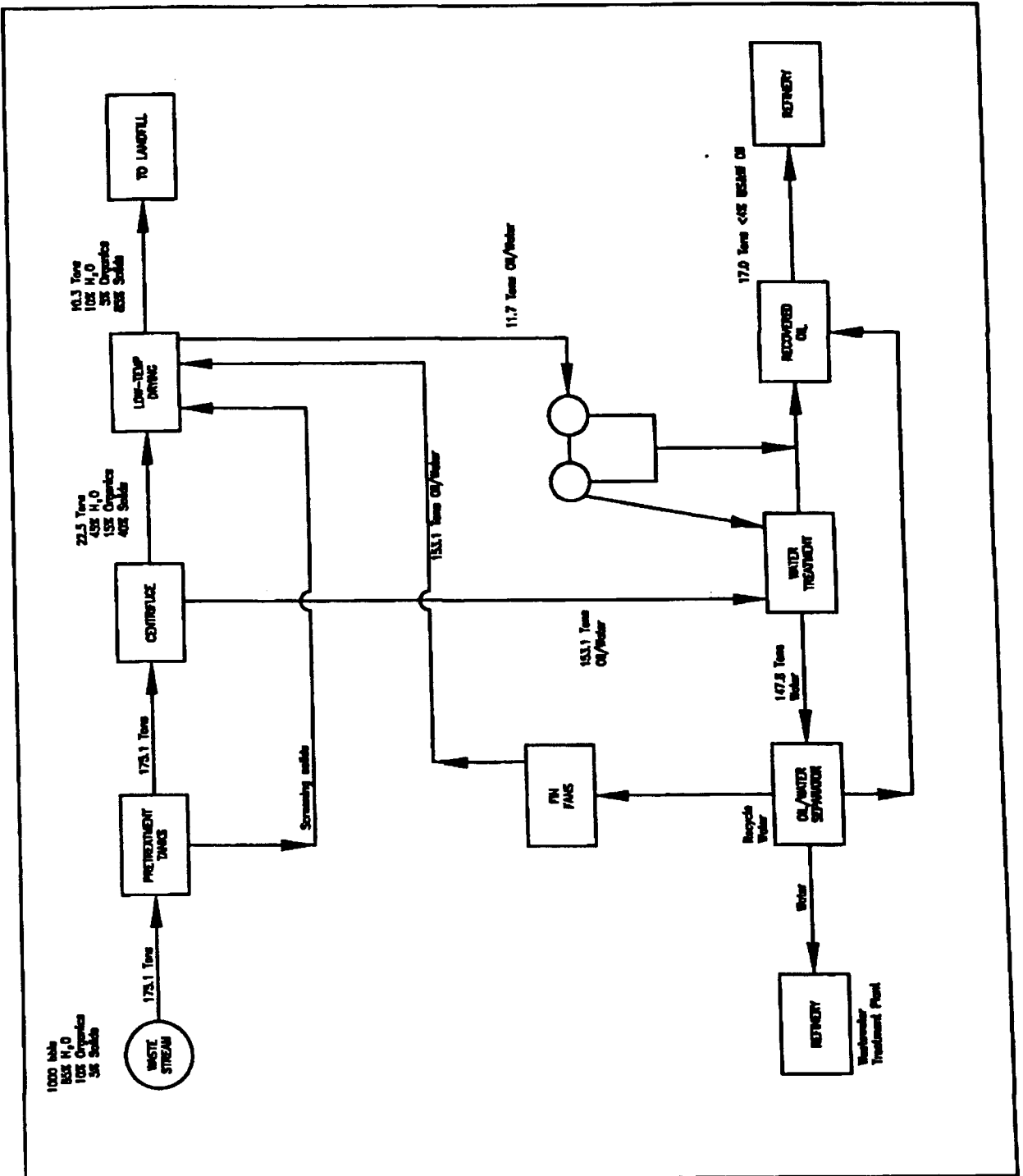


Apex  
Environmental, Inc.

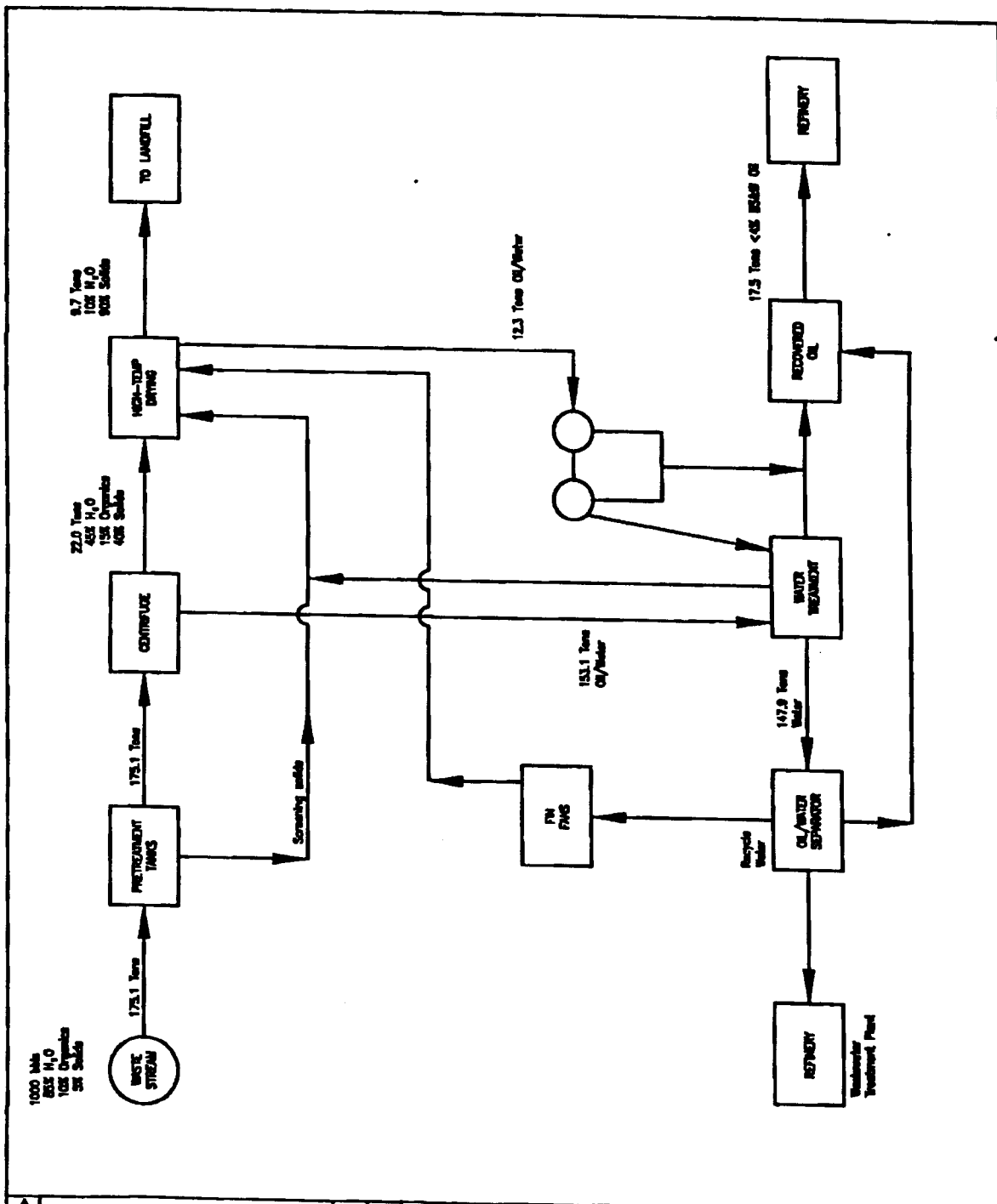




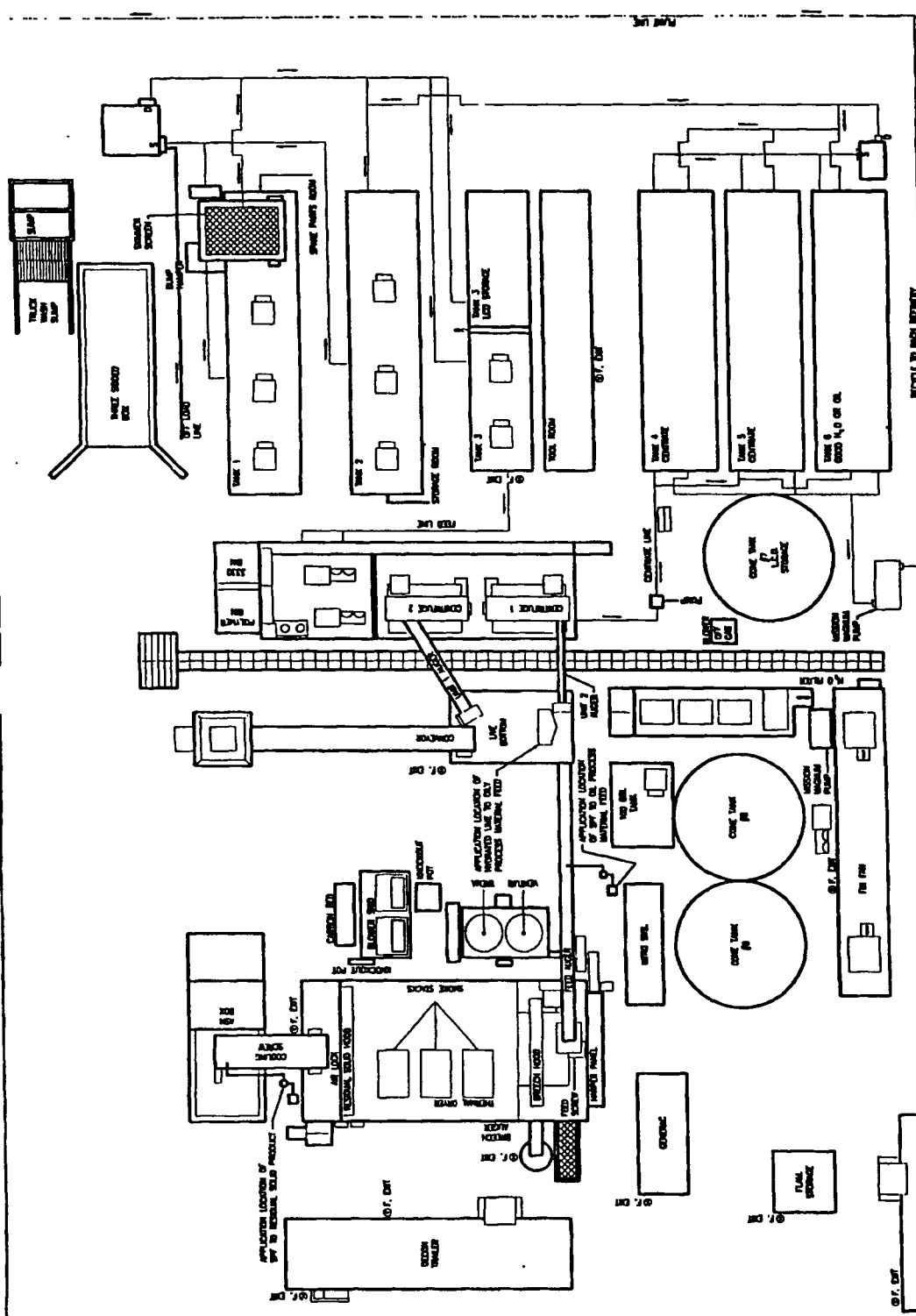
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	DCN		MM	APP		
	SCALE		N.T.S.			
	FILE NAME		FIGURE 7			
	NO.		REVISION	BY		
DRAWING NO.		FIGURE 7		REV.		0



	NO.		REVISION		BY	APP.	DATE
	DWG		CHK		SWB		
	DCN		MH		APP		
	SCALE		N.T.S.				
FILE NAME		FIGURE 8					
TITLE <b>TYPICAL PROCESS FLOW          HAZARDOUS WASTE</b>							
CLIENT <b>MOTNA ENTERPRISES          LLC NORCO, LOUISIANA</b>							
DRAWING NO.						REV.	
FIGURE 8						0	



	NO.	REVISION	BY	APP.	DATE	<b>TYPICAL PROCESS FLOW K AND F WASTE</b>	CLIENT	MOTIVA ENTERPRISES LLC NORCO, LOUISIANA	
	DWC		CHK	SHD	TITLE		DRAWING NO.	REV.	
	DCM		MM	APP					
	SCALE		N.T.S.						
	FILE NAME		FIGURE 8						FIGURE 8



PLAN

		STABILIZING MATERIAL APPLICATION LOCATIONS NORCO OIL RECYCLING UNIT		SCALE: N.T.S.		DATE:		DRAWN BY:		CHECKED BY:		APPROVED BY:		DATE:		SHEET NO.		FIGURE NO.		TOTAL SHEETS	
				SCALE:		DATE:		DRAWN BY:		CHECKED BY:		APPROVED BY:		DATE:		SHEET NO.		FIGURE NO.		TOTAL SHEETS	
MOTIVA ENTERPRISES LLC NORCO, LOUISIANA		DATE:		DRAWN BY:		CHECKED BY:		APPROVED BY:		DATE:		SHEET NO.		FIGURE NO.		TOTAL SHEETS		TOTAL SHEETS		TOTAL SHEETS	



## **Appendix C**

### **Conditions and Criteria in Previously-Approved Relevant Delisting Petitions**

**C-1 Marathon's Texas Refining Division (Texas City, Texas)**

**C-2 Marathon's Louisiana Refining Division (Garyville, Louisiana)**

## **Appendix C-1**

**Marathon's Texas Refining Devision (Texas City, Texas)**

TABLE 2—WASTES EXCLUDED FROM SPECIFIC SOURCES—Continued

Facility	Address	Waste description
Enviro Corp.	Canton, Ohio; Harvey, Illinois; and York PA.	Spent pickle liquor (EPA Hazardous Waste No. K062) generated from steel finishing operations of facilities within the iron and steel industry (SIC Codes 331 and 332); wastewater treatment sludge (EPA Hazardous Waste No. K002) generated from the production of chrome yellow and orange pigments; wastewater treatment sludge (EPA Hazardous Waste No. K003) generated from the production of molybdate orange pigments; wastewater treatment sludge (EPA Hazardous Waste No. K004) generated from the production of zinc yellow pigments; wastewater treatment sludge (EPA Hazardous Waste No. K005) generated from the production of chrome green pigments; wastewater treatment sludge (EPA Hazardous Waste No. K006) generated from the production of chrome oxide green pigments (anhydrous and hydrated); wastewater treatment sludge (EPA Hazardous Waste No. K007) generated from the production of iron blue pigments; oven residues (EPA Hazardous Waste No. K008) generated from the production of chrome oxide green pigments after November 14, 1986. To ensure that hazardous constituents are not present in the waste at levels of regulatory concern, the facility must implement a contingency testing program for the petitioned wastes. This testing program must meet the following conditions for the exclusions to be valid: (1) Each batch of treatment residue must be representatively sampled and tested using the EP Toxicity test for arsenic, barium, cadmium, chromium, lead, selenium, silver, mercury, and nickel. If the extract concentrations for chromium, lead, arsenic, and silver exceed 0.315 ppm; barium levels exceed 6.3 ppm; cadmium and selenium exceed 0.063 ppm; mercury exceeds 0.0126 ppm; or nickel levels exceed 2.205 ppm, the waste must be re-treated or managed and disposed as a hazardous waste under 40 CFR Parts 262 to 265 and the permitting standards of 40 CFR Part 270. (2) Each batch of treatment residue must be tested for reactive and leachable cyanide. If the reactive cyanide levels exceed 250 ppm; or leachable cyanide levels (using the EP Toxicity test without acetic acid adjustment) exceed 1.26 ppm, the waste must be re-treated or managed and disposed as hazardous waste under 40 CFR Parts 262 to 265 and the permitting standards of 40 CFR Part 270. (3) Each batch of waste must be tested for the total content of specific organic toxicants. If the total content of anthracene exceeds 76.8 ppm, 1,2-diphenyl hydrazine exceeds 0.001 ppm, methylene chloride exceeds 8.18 ppm, methyl ethyl ketone exceeds 328 ppm, n-nitrosodiphenylamine exceeds 11.9 ppm, phenol exceeds 1,568 ppm, tetrachloroethylene exceeds 0.168 ppm, or tetrachloroethylene exceeds 0.592 ppm, the waste must be managed and disposed as a hazardous waste under 40 CFR Parts 262 to 265 and the permitting standards of 40 CFR Part 270. (4) A grab sample must be collected from each batch to form one monthly composite sample which must be tested using GC/MS analysis for the compounds listed in §3 above as well as the remaining organics on the priority pollutant list. (See 47 FR 52309, November 19, 1982, for a list of the priority pollutants.) (5) The data from conditions 1-4 must be kept on file at the facility for inspection purposes and must be compiled, summarized, and submitted to the Administrator by certified mail semi-annually. The Agency will review this information and if needed will propose to modify or withdraw the exclusion. The organics testing described in conditions 3 and 4 above is not required until six months from the date of promulgation. The Agency's decision to conditionally exclude the treatment residue generated from the wastewater treatment systems at these facilities applies only to the wastewater and solids treatment systems as they presently exist as described in the petition. The exclusion does not apply to the proposed process additions described in the petition as recovery, including crystallization, electrolytic metals recovery, evaporative recovery, and ion exchange. Brine purification mude and wastewater treatment sludges generated after August 27, 1986 from their chlor-alkali manufacturing operations (EPA Hazardous Waste Nos. K071 and K106) that have been batch tested for mercury using the EP toxicity procedures and have been found to contain less than 0.05 ppm mercury in the EP extract. Brine purification mude and wastewater treatment sludges that exceed this level will be considered a hazardous waste.
LCP Chemical	Orrington, ME	Residual solids (at a maximum annual generation rate of 1,000 cubic yards) generated from the thermal desorption treatment and, where necessary, stabilization of wastewater treatment plant API/DAF filter cake (EPA Hazardous Waste Nos. K048 and K051), after [insert date of publication]. Marathon must implement a testing program that meets the following conditions for the exclusion to be valid: (1) Testing: Sample collection and analyses (including quality control (QC) procedures) must be performed according to SW-846 methodologies. If EPA judges the treatment process to be effective under the operating conditions used during the initial verification testing, Marathon may replace the testing required in Condition (1)(A) with the testing required in Condition (1)(B). Marathon must continue to test as specified in Condition (1)(A), including testing for organics in Conditions (3)(B) and (3)(C), until and unless notified by EPA in writing that testing in Condition (1)(A) may be replaced by Condition (1)(B), or that testing for organics may be terminated as described in (1)(C) to the extent directed by EPA).
Marathon Oil Co.	Texas City, Texas.	

TABLE 2—WASTES EXCLUDED FROM SPECIFIC SOURCES—Continued

Facility	Address	Waste description
		<p>(A) <b>Initial Verification Testing:</b> During at least the first 40 operating days of full-scale operation of the thermal desorption unit, Marathon must monitor the operating conditions and analyze 5-day composites of residual solids. 5-day composites must be composed of representative grab samples collected from every batch during each 5-day period of operation. The samples must be analyzed prior to disposal of the residual solids for constituents listed in Condition (3). Marathon must report the operational and analytical test data, including quality control information, obtained during this initial period no later than 90 days after the treatment of the first full-scale batch.</p> <p>(B) <b>Subsequent Verification Testing:</b> Following notification by EPA, Marathon may substitute the testing conditions in (1)(B) for (1)(A). Marathon must continue to monitor operating conditions, and analyze samples representative of each month of operation. The samples must be composed of representative grab samples collected during at least the first five days of operation of each month. These monthly representative samples must be analyzed for the constituents listed in Condition (3) prior to the disposal of the residual solids. Marathon may, at its discretion, analyze composite samples gathered more frequently to demonstrate that smaller batches of waste are non-hazardous.</p> <p>(C) <b>Termination of Organic Testing:</b> Marathon must continue testing as required under Condition (1)(B) for organic constituents specified in Conditions (3)(B) and (3)(C) until the analyses submitted under Condition (1)(B) show a minimum of four consecutive monthly representative samples with levels of specific constituents significantly below the delisting levels in Conditions (3)(B) and (3)(C), and EPA notifies Marathon in writing that monthly testing for specific organic constituents may be terminated. Following termination of monthly testing, Marathon must continue to test a representative 5-day composite sample for all constituents listed in Conditions (3)(B) and (3)(C) on an annual basis. If delisting levels for any constituents listed in Conditions (3)(B) and (3)(C) are exceeded in the annual sample, Marathon must reinstitute complete testing as required in Condition (1)(B).</p> <p>(2) <b>Waste Holding and Handling:</b> Marathon must store as hazardous all residual solids generated until verification testing (as specified in Conditions (1)(A) and (1)(B)) is completed and valid analysis demonstrates that Condition (3) is satisfied. If the levels of hazardous constituents in the samples of residual solids are below all of the levels set forth in Condition (3), then the residual solids are non-hazardous and may be managed and disposed of in accordance with all applicable solid waste regulations. If hazardous constituent levels in any 5-day composite or other representative sample equal or exceed any of the delisting levels set in Condition (3), the residual solids generated during the corresponding time period must be retreated and/or stabilized as allowed below, until the residual solids meet these levels, or managed and disposed of in accordance with Subtitle C of RCRA.</p> <p>If the residual solids contain leachable inorganic concentrations at or above the delisting levels set forth in Condition (3)(A), then Marathon may stabilize the material with Type 1 portland cement as demonstrated in the petition to immobilize the metals. Following stabilization, Marathon must repeat analyses in Condition (3)(A) prior to disposal.</p> <p>(3) <b>Delisting Levels:</b> Leachable concentrations in Conditions (3)(A) and (3)(B) must be measured in the waste leachate by the method specified in 40 CFR 261.24. The indicator parameters in Condition (3)(C) must be measured as the total concentration in the waste. Concentrations must be less than the following levels (ppm):</p> <p>(A) <b>Inorganic Constituents:</b> antimony-0.5; arsenic, chromium, or silver-5.0; barium-100.0; beryllium-0.4; cadmium-0.5; lead-1.5; mercury-0.2; nickel-10.0; selenium-1.0; vanadium-20.0.</p> <p>(B) <b>Organic Constituents:</b> acenaphthene-200; benzene-0.5; benzo(a)anthracene-0.01; benzo(a)pyrene-0.02; benzo(b)fluoranthene-0.02; chrysene-0.02; ethyl benzene-70; fluoranthene-100; fluorene-100; naphthalene-100; pyrene-100; toluene-100.</p> <p>(C) <b>Indicator Parameters:</b> 1-methyl naphthalene-3; benzo(a)pyrene-3.</p> <p>(4) <b>Changes in Operating Conditions:</b> After completing the initial verification test period in Condition (1)(A), if Marathon significantly changes the operating conditions established under Condition (1), Marathon must notify the Agency in writing. After written approval by EPA, Marathon must re-institute the testing required in Condition (1)(A) for a minimum of four 5-day operating periods. Marathon must report the operations and test data, required by Condition (1)(A), including quality control data, obtained during this period no later than 60 days after the changes take place. Following written notification by EPA, Marathon may replace testing Condition (1)(A) with (1)(B). Marathon must fulfill all other requirements in Condition (1), as appropriate.</p>

TABLE 2—WASTES EXCLUDED FROM SPECIFIC SOURCES—Continued

Facility	Address	Waste description
		<p>(5) <i>Data Submittals:</i> At least two weeks prior to system start-up, Marathon must notify in writing the Section Chief, Disting Section (see address below) when the thermal desorption and stabilization units will be on-line and waste treatment will begin. The data obtained through Condition (1)(A) must be submitted to the Section Chief, Disting Section, OSW (OS-333), U.S. EPA, 401 M Street, SW., Washington, DC 20460 within the time period specified. Records of operating conditions and analytical data from Condition (1) must be compiled, summarized, and maintained on site for a minimum of five years. These records and data must be furnished upon request by EPA or the State of Texas and made available for inspection. Failure to submit the required data within the specified time period or maintain the required records on site for the specified time will be considered by EPA, at its discretion, sufficient basis to revoke the exclusion to the extent directed by EPA. All data must be accompanied by a signed copy of the following certification statement to attest to the truth and accuracy of the data submitted:</p> <p>"Under civil and criminal penalty of law for the making or submission of false or fraudulent statements or representations (pursuant to the applicable provisions of the Federal Code, which include, but may not be limited to, 18 U.S.C. 1001 and 42 U.S.C. 6922b), I certify that the information contained in or accompanying this document is true, accurate, and complete.</p> <p>As to the (those) identified section(s) of this document for which I cannot personally verify its (their) truth and accuracy, I certify as the company official having supervisory responsibility for the persons who, acting under my direct instructions, made the verification that this information is true, accurate, and complete.</p> <p>In the event that any of this information is determined by EPA to its sole discretion to be false, inaccurate, or incomplete, and upon conveyance of this fact to the company, I recognize and agree that this exclusion of waste will be void as if it never had effect or to the extent directed by EPA and that the company will be liable for any actions taken in contravention of the company's RCRA and CERCLA obligations premised upon the company's reliance on the void exclusion."</p>
Mead Corp.	Peekskill, NY	Wastewater treatment sludge (EPA Hazardous Waste Nos. K006 and K007) generated from the production of chrome oxide green and iron blue pigments after November 27, 1985.
Monsanto Industrial Chemicals Company.	Saugat, Illinois	Brine purification sludge (EPA Hazardous Waste No. K071) generated from the mercury cell process in chlorine production, where separately prepared brine is not used after August 15, 1985.
Occidental Chemical Corp. Muscle Shoals Plant.	Sheffield, Alabama.	<p>Retorted wastewater treatment sludge from the mercury cell process in chlorine production (EPA Hazardous Waste No. K106) after September 19, 1985. This exclusion is conditional upon the submission of data obtained from Occidental's full-scale retort treatment system because Occidental's original data were based on a pilot-scale retort system. To ensure that hazardous constituents are not present in the waste at levels of regulatory concern once the full-scale treatment facility is in operation, Occidental must implement a testing program. All sampling and analyses (including quality control procedures) must be performed according to SW-846 procedures. This testing program must meet the following conditions for the exclusion to be valid:</p> <p>(1) <i>Initial Testing</i>—During the first four weeks of full-scale retort operation, Occidental must do the following:</p> <p>(A) Collect representative grab samples from every batch of retorted material and composite the grab samples to produce a weekly composite sample. The weekly composite samples, prior to disposal or recycling, must be analyzed for the EP leachate concentrations of all the EP toxic metals (except mercury), nickel, and cyanide (using distilled water in the cyanide extractions), and the total constituent concentrations of reactive sulfide and reactive cyanide. Occidental must report the analytical test data, including all quality control data, obtained during this initial period no later than 90 days after the treatment of the first full-scale batch.</p> <p>(B) Collect representative grab samples of every batch of retorted material prior to its disposal or recycling and analyze the sample for EP leachate concentration of mercury. Occidental must report the analytical test data, including all quality control data, within 90 days after the treatment of the first full-scale batch.</p> <p>(2) <i>Subsequent Testing</i>—After the first four weeks of full-scale retort operation, Occidental must do the following:</p> <p>(A) Continue to sample and test as described in condition (1)(A). Occidental must compile and store on-site for a minimum of three years all analytical data and quality control data. These data must be furnished upon request and made available for inspection by any employee or representative of EPA or the State of Alabama. These testing requirements shall be terminated by EPA when the results of four consecutive weekly composite samples of the petitioned waste, obtained from either the initial testing or subsequent testing show the maximum allowable levels in condition (3) are not exceeded and the Section Chief, Variances Section, notifies Occidental that the requirements of this condition have been filled.</p> <p>(B) Continue to sample and test for mercury as described in condition (1)(B).</p>

## **Appendix C-2**

**Marathon's Louisiana Refining Division (Garyville, Louisiana)**

Appendix E - Wastes Excluded Under LAC 33:V.105.M

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
Marathon Oil Co.	Garyville, LA	Residual solids generated from the thermal desorption treatment of the following wastes: EPA Hazardous Waste No. K048, dissolved air flotation (DAF) float; K049, slop oil emulsion solids; K050, heat exchanger bundle cleaning sludge; K051, American Petroleum Institute (API) separator sludge; F037, primary oil/water/solids separation sludge; and F038, secondary emulsified oil/water/solids separation sludge. The constituents of concern for K048-K051 wastes are listed as hexavalent chromium and lead (see LAC 33:V.4901). The constituents of concern for F037 and F038 wastes are listed as hexavalent chromium, lead, benzene, benzo(a)pyrene, and chrysene (See LAC 33:V.4901). Marathon must implement a testing program that meets the following conditions for the exclusion to be valid:
		<p>(1) - Testing:</p> <p>Sample collection and analyzes, including quality control (QC) procedures, must be performed according to methodologies described in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication Number SW-846, as incorporated by reference in LAC 33:V.110. If the department judges the desorption process to be effective under the operating conditions used during the initial verification testing, Marathon may replace the testing required in condition (1)(A) with the testing required in (1)(B). Marathon must continue to test as specified in condition (1)(A) until and unless notified by the department in writing that testing in condition (1)(A) may be replaced by condition (1)(B), or that testing requirements may be reduced or terminated as described in conditions (1)(C) and (1)(D) to the extent directed by the department.</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(1)(A) - Initial Verification Testing:</p> <p>During at least the first four weekly operating periods of full-scale operation of the thermal desorption unit, Marathon must monitor the operating conditions of the thermal desorption unit to maintain a minimum residual solids temperature throughout the high temperature unit of 870 ° F. The residual solids must be analyzed as weekly composites. The weekly composites must be composed of a minimum of two representative grab samples from each operating day during each weekly period of operation. The samples must be analyzed for the constituents listed in condition (3) prior to disposal of the residual solids. Marathon must report the operational and analytical test data, including quality control information, obtained during this initial period, no later than 90 days after initiating full-scale processing.</p>
		<p>(1)(B) - Subsequent Verification Testing:</p> <p>Following notification of approval by the department, Marathon may substitute the following testing conditions for those in condition (1)(A). Marathon must continue to monitor operating conditions and analyze samples representative of each month of operation. The samples must be composed of eight representative samples from randomly chosen operating days during the four-week period of operation of each month. These monthly representative composite samples must be analyzed for the constituents listed in condition (3) prior to the disposal of the residual solids. Marathon may, at its discretion, analyze composite samples gathered more frequently to demonstrate that smaller batches of waste are nonhazardous.</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(1)(C) - Termination of Monthly Organic Testing:</p> <p>Marathon must continue to monitor unit operating conditions and perform testing as required under condition (1)(B), for the constituents listed in condition (3)(B), until the analyzes submitted under condition (1)(B) show a minimum of three consecutive monthly representative samples with levels of constituents significantly below delisting levels listed in condition (3)(B). Following notification of approval by the department, Marathon may terminate monthly testing for the organic constituents found in condition (3)(B). Following termination of monthly testing for organic constituents, Marathon must test representative composite sample, composited over a one-week time period, for all constituents listed in condition (3)(B) on a quarterly basis. If delisting levels for any organic constituents listed condition (3)(B) are exceeded in the quarterly sample, Marathon must reinstitute testing as required in condition (1)(B).</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(1)(D) - Termination of Monthly Inorganic Testing:</p> <p>Marathon must continue to monitor unit operating conditions and perform testing as required under condition (1)(B), for the constituents listed in condition (3)(A), until the analyzes submitted under condition (1)(B) show a minimum of three consecutive monthly representative samples with levels of constituents significantly below delisting levels listed in condition (3)(A). Following notification of approval by the department, Marathon may terminate monthly testing for the inorganic constituents found in condition (3)(A). Following termination of monthly testing for inorganic constituents, Marathon must test a representative composite sample, composited over a one-week time period, for all constituents listed in condition (3)(A) on a quarterly basis. If delisting levels for any inorganic constituents listed in condition (3)(A) are exceeded in the quarterly sample, Marathon must reinstitute testing as required in condition (1)(B).</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(2) - Waste Holding and Handling:</p> <p>Marathon must store as hazardous wastes all residual solids generated until each batch has completed verification testing, as specified in conditions (1)(A) - (1)(D), and has satisfied the delisting criteria, as specified in condition (3). If the levels of constituents in the samples of residual solids are below all of the applicable levels set forth in condition (3), then the residual solids thereby become nonhazardous solid wastes and may be managed and disposed of in accordance with all applicable solid waste regulations. If constituent levels in any weekly composite or other representative sample equal or exceed any of the delisting levels set in condition (3), the residual solids generated during the corresponding period must be retreated to meet the delisting levels or managed and disposed of in accordance with subtitle C of RCRA.</p>
		<p>(3) - Delisting Levels:</p> <p>The following delisting levels have been determined safe by taking into account health-based criteria and limits of detection. Concentrations in conditions (3)(A) and (3)(B) must be measured in the extract from the samples by the method specified in LAC 33:V. 4903.E. Concentrations in the extract must be less than the following levels (all units are milligrams per liter):</p>
		<p>(3)(A) - Inorganic Constituents:</p> <p>Antimony - 0.22; Arsenic - 0.40; Barium - 72; Beryllium - 0.14; Cadmium - 0.18; Chromium - 3.6; Lead - 0.54; Mercury - 0.072; Nickel - 3.6; Selenium - 1.8; Silver - 7.2; Vanadium - 7.2.</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(3)(B) - Organic Constituents:</p> <p>Acenaphthene - 72; Benzene - 0.18; Benzo(a)anthracene - 0.050; Benzo(a)pyrene - 0.050; Benzo(b)fluoranthrene - 0.050; Bis(2-ethylhexyl)phthalate - 0.22; Chrysene - 0.05; Ethylbenzene - 25; Fluoranthrene - 72; Fluorene - 72; Napthalene - 36; Pyrene - 72; Toluene - 36.</p>
		<p>(4) - Changes in Operating Conditions:</p> <p>After completing the initial verification test period in condition (1)(A), if Marathon significantly changes the operating conditions specified in the petition, Marathon must notify the department in writing. Following receipt of written approval by the department, Marathon must reinstitute the testing required in condition (1)(A) for a minimum of four weekly operating periods. Marathon must report unit operating conditions and test data required by condition (1)(A), including quality control data, obtained during this period no later than 60 days after the changes take place. Following written notification by the department, Marathon may replace testing condition (1)(A) with (1)(B), or reduce or terminate testing requirements as described in conditions (1)(C) and (1)(D) to the extent directed by the department. Marathon must fulfill all other requirements in condition (1).</p>

Table E.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(4)(A) - Processing Equipment:</p> <p>Marathon may elect to change thermal desorption processing equipment based on operational performance and economic considerations. In the event that Marathon changes operating equipment, i.e., generic thermal desorption units, Marathon must reinstitute processing and initiate testing required in condition (1)(A) for a minimum of four weekly operating periods. Marathon must report unit operating conditions and test data required in condition (1)(A), including quality control data, obtained during this period no later than 60 days after the changes take place. Following written notification by the department, Marathon may replace testing condition (1)(A) with (1)(B), or reduce or terminate testing requirements as described in conditions (1)(C) and (1)(D) to the extent directed by the department. Marathon must fulfill all other requirements in condition (1).</p>
		<p>(4)(B) - Batch Processing:</p> <p>Marathon may periodically elect to change operating conditions to accommodate batch processing of single-event waste generations. In the event that Marathon initiates batch processing and changes the operating conditions established under condition (1), Marathon must reinstitute the testing required in condition (1)(A) during such batch processing events and monitor unit operating conditions and perform testing required by condition (1)(A), as appropriate. Following the completion of batch processing operations, Marathon must return to the operating conditions applicable prior to initiation of the batch processing and may return to the testing conditions that were applicable prior to the initiation of the batch processing activities.</p>

Table B.1 - Wastes Excluded		
Facility	Address	Waste Description
		<p>(5) - Data Submittal:</p> <p>Marathon must notify the department in writing at least two weeks prior to initiating condition (1)(A). The data obtained during condition (1)(A) must be submitted to the Assistant Secretary of the Office of Waste Services, LDEQ, 7290 Bluebonnet Road, Baton Rouge, LA 70810, within the specified 90 days. Records of operating conditions and analytical data from condition (1) must be compiled, summarized, and maintained on site for a minimum of five years. These records and data must be furnished upon request by the department and made available for inspection. Failure to submit the required data within the specified time period or failure to maintain the required records on-site for the specified time will be considered by the department, at its discretion, sufficient basis to revoke the exclusion. All data must be accompanied by a signed copy of the following certification statement to attest to the truth and accuracy of the data submitted:</p>
		<p>"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.</p> <p>In the event that any of this information is determined by the department, in its sole discretion, to be false, inaccurate, or incomplete, and upon conveyance of this fact to the company, I recognize and agree that this exclusion of waste will be void as if it never had been in effect."</p>

**AUTHORITY NOTE:** Promulgated in accordance with R.S. 30:2180 et seq.  
**HISTORICAL NOTE:** Promulgated by the Department of Environmental Quality LR 20:1000 (September 1994), amended by the Office of Solid and Hazardous Waste, Hazardous Waste Division, LR 21:944 (September 1995), LR 22:830 (September 1996), amended by the Office of Waste Services, Hazardous Waste Division, LR 23:959 (August 1997).

## **Appendix D**

### **Suggested Regulatory Language and Conditional Exclusion Conditions**

**Motiva Enterprises, LLC – Norco Refinery  
Norco, Louisiana  
Conditional Exclusion Conditions**

**Norco's Proposed Language**

**Norco Refinery / Norco, Louisiana**

Residual solids (at a maximum annual generation rate of 8,000 cubic yards per year [6,000 tons/year]) generated from the thermal desorption recycling of petroleum process solids, which are classified as newly generated EPA Hazardous Waste No. F037, after *(date of final promulgation)*. The constituents of concern for F037 waste are listed as hexavalent chromium, lead, benzene, benzo(a)pyrene, and chrysene (see LAC 33:V.4901). Norco must implement a testing and management program that meets the following conditions for the exclusion to be valid:

**(1) - Monitoring**

Norco will monitor operating conditions of the thermal desorption unit to maintain thermal desorption temperatures of  $>1300^{\circ}\text{F}$  in the firebox and residence time of about 30 minutes in the unit. In addition, operational data will include summaries of daily processing rates, operational logs and temperature logs of operating conditions within the thermal tube. The consistent monitoring of operational parameters and processing temperature will provide verification of the effectiveness of the recycling process. Records of operating conditions and analytical data will be compiled, summarized, and maintained on site for a minimum of five years.

**(2) – Testing**

**To Be Determined**

**(3) – Waste Holding and Handling**

Consequent to this exclusion, Norco must store as hazardous all residual solids generated until verification testing, as specified in Condition (2), is completed and valid analysis demonstrates that delisting criteria, as specified in Condition (4), have been satisfied. If the levels of constituents in the samples of residual solids are below all of the applicable levels set forth in Condition (4), then the residual solids are non-hazardous and may be managed and disposed of in accordance with all applicable solid waste regulations. If constituent levels in any composite or other representative sample equal or exceed any of the delisting levels set in Condition (4), the residual solids generated during the processing of that batch may be:

- retreated to meet the delisting levels;
- stabilized (using appropriate concentrations hydrated lime or Portland cement, as determined by treatability testing of the material) to meet the delisting levels; or
- managed and disposed of in accordance with Subtitle C of RCRA.

#### **(4) – Delisting Levels**

**To Be Determined**

#### **(5) - Changes in Operational Conditions**

If Norco significantly changes the operating conditions established under conditions currently utilized, Norco will notify the LDEQ in writing. Norco may elect to change thermal desorption processing equipment, based on operational performance and economic considerations. This may include expansion of the capacity of the unit. In the event that Norco changes operating equipment, i.e., generic thermal desorption units, Norco must notify the LDEQ in writing.

#### **(6) – Data Submittal**

All analytical data will be summarized and submitted to the Section Chief, Delisting Section, LDEQ, 7290 Bluebonnet Road, Baton Rouge, LA 70810, annually. Records of operating conditions and analytical data will be compiled, summarized, and maintained on site for a minimum of five years. These records and data must be furnished upon request by LDEQ and made available for inspection. Failure to submit the required data within the specified time period or maintain the required records on site for the specified time will be considered by LDEQ, at its discretion, sufficient basis to revoke the exclusion to the extent directed by LDEQ. All data must be accompanied by a signed copy of the following certification statement to attest to the truth and accuracy of the data submitted:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that, based on my inquiry of those individuals immediately responsible for obtaining the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In the event that any of this information is determined by the department, in its sole discretion, to be false, inaccurate, or incomplete, and upon conveyance of this fact to the company, I recognize and agree that this exclusion of waste will be liable for any actions taken in contravention of the company's environmental obligations under the Louisiana Environmental Quality Act premised upon the company's reliance on the void exclusion."

# **Appendix E**

## **Delisting Demonstration Sampling and Analysis**

### **E-1 Plans**

- E-1-A Sampling and Analysis Plan**
- E-1-B Sampling and Analysis Plan Addendum**
- E-1-C Quality Assurance Project Plan (includes Pace QAPP)**

### **E-2 Summary of Sampling Requirements**

- E-2-A Sampling Event # 1 (BP America, Inc. Sample #1)- 9/11/98**
- E-2-B Sampling Event # 2 (BP America, Inc. Sample #2)- 1/27/99**
- E-2-C Sampling Event # 3 (Norco Tank # 409 Sample #3)- 4/27/99**
- E-2-D Sampling Event # 4 (Norco Tank # 409 Sample #4)- 5/12/99**
- E-2-E Sampling Event # 5 (Stabilization - BP America, Inc.  
Samples #3, 4, & 5)- 7/5-7/00**

### **E-3 Sampling Documentation**

- E-3-A Sampling Event # 1 (BP America, Inc. Sample #1)- 9/11/98**
- E-3-B Sampling Event # 2 (BP America, Inc. Sample #2)- 1/27/99**
- E-3-C Sampling Event # 3 (Norco Tank # 409 Sample #3)- 4/27/99**
- E-3-D Sampling Event # 4 (Norco Tank # 409 Sample #4)- 5/12/99**
- E-3-E Sampling Event # 5 (Stabilization - BP America, Inc.  
Samples #3, 4, & 5)- 7/5-7/00**

## **Appendix E-1**

### **Plans**

- E-1-A    Sampling and Analysis Plan**
- E-1-B    Sampling and Analysis Plan Addendum**
- E-1-C    Quality Assurance Project Plan (includes Pace QAPP)**

# **Appendix E-1-A**

## **Sampling and Analysis Plan**

**Beyond RCRA:  
Prospects for Waste and Materials Management  
In the Year 2020**

**Draft White Paper**

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## **Acknowledgments and Disclaimer**

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This paper is a work in progress. It is not a statement of EPA or ASTSWMO policy, or of the state agencies or tribes represented on the Workgroup. This paper is intended only to provoke thought and facilitate a public dialogue to explore possible directions for the mid- to long-term future of the RCRA program. The authors expect that this paper will be revised and amended extensively and often, based on future discussions and analyses. The ideas presented in this paper will remain open to honest reflection, and to the ideas of any and all who may wish to offer comments on it. Comments on the draft paper are welcomed, and may be submitted by email to [leith.angie@epa.gov](mailto:leith.angie@epa.gov).

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## **Beyond RCRA: Prospects for Waste and Materials Management In the Year 2020**

*"Looking into the future is a fool's occupation, but it is the bigger fool who dares not to."  
--Voltaire*

### ***A Vision of the Future:***

*The year is 2020, and America's wasteful ways are a thing of the past. New technologies and a changed economic climate, combined with enlightened government policies and a pronounced shift in societal and corporate attitudes have resulted in dramatic decreases in the volumes and toxicity of industrial wastes generated by the country's industries. Materials that were once considered wastes suitable only for landfilling are now continually reused and recycled, and "industrial ecology" has become the mantra of corporate executives across the nation. The small volumes of wastes that actually need disposal are carefully managed under an efficient and environmentally protective system that features a mix of economic incentives, voluntary measures and regulatory controls. "Mining" of old industrial and municipal landfills has become a profitable business, while cleanup of most contaminated sites has been largely completed, and thousands of areas once known as brownfields have been put back into productive use.*

*In the meantime, generating and managing post-consumer household wastes has undergone a similar transformation. Concern for environmental sustainability has become ingrained as a societal value, as individuals have become much more aware of the environmental consequences of their consumptive choices. Household recycling appliances, as well as advances in packaging, product design and other measures have reduced household waste generation rates to a small fraction of what they were in the late twentieth century. Far fewer toxic chemicals are now used to manufacture consumer products, and consumers are now far better informed of the potential risks from chemicals in the goods and services that they use.*

*By the year 2020, a chemically safe environment has also become established legally and culturally as a basic human right. In addition, advancements in telecommunications have created much closer linkages between government agencies, citizens and businesses, and the resulting flows of information have enabled a more participatory approach to making environmental decisions that affect local communities. These developments have in part prompted pollution abatement measures that ensure lower income communities no longer bear disproportionately high risks from exposure to industrial chemical emissions.*

*These gains in waste and materials management have not, of course, been confined to the United States. Heightened concerns over the health of the global environment, combined with an*

*increasingly globalized economic system, have created new institutions and policies to promote environmental sustainability and ensure that wastes and materials are managed wisely worldwide.*

What kind of world will we actually inhabit in 2020? Some predict that it will be better than the present - where products and materials will be less toxic, reusable, and wastes profitable to reduce. In contrast, others predict that we will experience a bleaker future - where harmful chemicals will be more prevalent throughout our environment and may seriously affect groundwater, drinking water, and food supplies. While we can't know which of these scenarios - or others - will exist in twenty years, it makes sense to consider the future now if we want a chance to positively shape it. This paper is intended to stimulate a dialogue around this important issue.

## **I. Introduction**

At the turn of the new century, the United States has now completed two decades of managing wastes under the federal Resource Conservation and Recovery Act (RCRA). In these past twenty years waste management practices have improved tremendously. Uncontrolled dumping of hazardous industrial wastes has decreased dramatically, and the number of facilities that handle hazardous wastes has shrunk by half. Municipal waste landfills have been upgraded across the country, while unlined hazardous waste landfills and lagoons have almost disappeared from our landscape. Thousands of contaminated sites across the country are being cleaned up to restore land to productive uses and protect ground water resources. Post-consumer recycling rates have risen dramatically, while many industries have made impressive gains in pollution prevention and reducing generation of toxic wastes.

Despite these impressive achievements, the RCRA program has also received its share of criticism, from public interest groups, industry and other stakeholders. This paper, however, is not an attempt to document or analyze the strengths and weaknesses of the RCRA program as we know it today. Rather, after two decades of experience with the current system it is time to look forward to the next 20 years, to begin examining how the program as we know it today could and should evolve to meet the challenges and opportunities of the new century. In 1999, the US EPA, in concert with state environmental agencies, formed a small working group to begin exploring the RCRA program's longer term future. In September, 1999 a roundtable meeting of experts from academia, industry and public interest organizations was convened in Washington, DC to lay the groundwork for this effort. That meeting provided a number of important insights regarding future technological, societal, environmental and economic trends, and how they may affect the future of waste management in this country. The proceedings of the roundtable meeting have been summarized in a separate paper.<sup>1</sup>

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<sup>1</sup> Copies of the "RCRA Vision Roundtable Meeting Summary" can be obtained by contacting Dave Fagan of EPA's Office of Solid Waste, at [fagan.david@epa.gov](mailto:fagan.david@epa.gov).

This White Paper has been prepared for the purpose of creatively engaging and stimulating dialogue on the future of the nation's waste management system, unconstrained by the current legal and institutional structure of the RCRA program. We are not advocating or recommending any particular policies or directions, nor is the paper intended to help advance any particular legislative action. We have also not attempted to quantify how effective any of the measures discussed in the paper might be, nor did we try to calculate their political feasibility.

At this time the paper's primary focus is to suggest the broad outlines of what a future RCRA program might look like, and the forces that might shape it. We have not attempted to suggest any strategy or "next steps" as to how such a future program could be developed, nor have we yet examined the many issues associated with how it might best be implemented. We believe that these issues will best be addressed once the essential elements of this future program have been defined with more clarity and certainty.

The scope of this paper is confined to exploring the future of waste and materials management in the United States, although we believe that much of its substance could be relevant to other nations with relatively affluent, industrial economies. In fact, as noted elsewhere in this paper, it is unrealistic in this era of increasing globalization to consider these issues in purely American terms, and we can certainly learn from other countries' experiences in this area. We acknowledge, however, that the problems we associate with waste and inefficient use of resources in the United States do not necessarily apply in those parts of the world where poverty and resource scarcities often transcend such concerns.

## **II. Trends and Future Directions**

In developing a vision for the future of RCRA (or whatever its successor program may be called), it was necessary to make certain projections and assumptions as to its future "landscape"—that is, the economic, technological and societal setting in which it will operate in the year 2020. These projections and assumptions (summarized below) have been organized into six broad categories: Resources, Health and Risk, Industry, Information, Globalization, and Society and Governance. Readers are invited to consider the validity of these projections and assumptions, and what effect other, different assumptions may have on the future of waste and materials management as discussed in this paper.

### ***Resources***

- **Pressures on natural resources will continue to increase.** We believe it is relatively safe to assume that worldwide demand for basic resources (e.g., fresh water, minerals, energy sources, fibers, etc.) will continue to increase over the next twenty years, as the world's population increases and the global economy continues to expand. It is also likely that a number of areas of the world that now have relatively low living standards will become more prosperous, which will also tend to increase demand for goods and services and the basic resources that are

used to supply them. It is not assumed that there will be wide-scale shortages of basic resources or commodities in the year 2020. However, it is expected that as worldwide demand for resources mounts, it is possible that some specific resources may become less abundant and/or more difficult to exploit in the future, which could increase their economic value. Some of these variations in supplies and costs of commodities/materials will likely vary geographically. Increased costs of some commodities would likely result in some changes in consumptive behavior, but should also create market pressures to develop substitute materials and/or products.

— **New technologies will change how resources are used and wasted.**

Technological advancements will also affect the availability of resources and the way we use them. It is entirely possible, for instance, that a dramatic technological breakthrough could alter in a positive way the current balance between resource supplies and demands, and the efficiency with which they are used. For example, a revolutionary new energy source could realize extraordinary environmental, economic and social benefits by substantially reducing the use of fossil fuels. It seems at the point unwise, however, to assume that technological advances will somehow rescue us from having to worry about these issues in the future. It is more likely that the effects of technological change on economic and ecological sustainability over the next few decades will be more mixed, though nevertheless profound.

This mixed prognosis could certainly be true not only as to how resources will be extracted and used in the future, but also how they will be wasted. For example, new technologies could enable extractive industries (e.g., minerals, petroleum, etc.) to become more efficient, and thus less wasteful. This is already being seen in a number of manufacturing industries, with the prospect of important future advances in energy efficiency, efficient use of materials, and materials substitution. Life spans of some products will likely increase, which could decrease waste volumes. On the other hand, technological innovations could create demands on different types of resources, or could produce new consumer products that are popular but resource intensive. The sheer rate of technological change could also result in many products that quickly become obsolete, which could also increase waste generation rates.

— **Need for more sustainable use of resources.** The general conclusion is that the current trend is toward greater demands on and consumption of material resources, in this country and elsewhere. While the economic value of some of these resources may increase, the more important (but often hidden) price to be paid may well be an environmental one. Extracting, producing and using ever-increasing volumes of material resources—most of which are finite—will inevitably have important environmental consequences. Some recent studies have projected that the current global economy cannot be sustained over the long term without

severe environmental consequences. The challenge at hand is therefore to create a system that enables economic prosperity to co-exist with a healthy global environment, by making more efficient use of the material resources that we consume.

### ***Health and Risk***

- **More chemicals and new risks.** The numbers and amounts of man-made chemicals that are produced, used and eventually disposed of have dramatically increased over the past several decades. This trend is expected to continue, and it is likely that by the year 2020 advances in chemistry, biology and other fields will have created tens of thousands of new chemical compounds, many of which will be derived from genetically engineered organisms. Undoubtedly, some of these new substances will have the potential for causing harm to human health and ecological systems.
- **Health effects of chemicals will be better understood.** It is expected that scientific advances over the next few decades will yield a much deeper understanding of how various chemicals affect human and other living organisms. It is likely we will learn that some chemicals are more harmful than we now think, while others may be found to be less harmful than is now understood. We will also likely better understand the health effects of chemicals among subpopulations, such as children and the elderly, people with genetically predisposed chemical sensitivities, and people who have had chronic or multiple exposures to chemicals. In addition, much more should be understood as to cumulative and synergistic risks to people who may be exposed to multiple chemicals over time because of where they live or work. As this information becomes available, communities with particularly high risk burdens will expect government and industry to take action to reduce those risks.
- **Methods for measuring and managing chemical risks will improve.** Techniques for estimating the fate and transport of chemicals in the environment should advance greatly in the next few decades, with corresponding advances in technologies used to detect and analyze (and perhaps characterize the risks of) chemicals in the environment. Life-cycle risks of chemicals as they are produced, used/reused and disposed of will be better understood, and it is likely that more examples will be identified of potentially harmful chemicals in common consumer goods and services (recent examples would include lead in gasoline, and mercury in home thermometers). As the public becomes more aware of these risks, it is possible that they will demand more comprehensive and proactive measures from industry and government to mitigate them.

## *Industry*

- **Industry will consume and waste different types of materials.** Over the next twenty to thirty years a wide range of new products and materials will be produced by the US economy, which will have important effects on the profile of manufacturing residuals (wastes, by-products, etc.) that are generated by industry. For instance, there are already many examples of products and industries in which potentially harmful chemicals have been phased out in favor of more benign materials. This trend, which we expect will continue, will have many positive environmental effects, including generation of wastes with lower hazard potential. On the other hand, production of some new chemicals and products may generate new, relatively high-risk waste streams. As some existing industries evolve over time, the volumes and characteristics of the wastes they generate can also be expected to change, for better or for worse. The geographic distribution of waste generating facilities in this country can also be expected to change in response to a number of different factors.
- **Industry will be more efficient and less wasteful.** Given the assumption that the economic value of certain basic materials and resources may broadly increase over the next few decades (as discussed above), it seems safe to assume that market forces will create greater incentives to use such materials more efficiently. This may be manifested in products that contain less expensive substitute materials, or that use less material per unit of production. More valuable materials will also create new incentives to reuse or recycle many products, as well as many wastes and by-products from various manufacturing processes. Technologies for reuse and recycling of materials should also advance in many areas, which could lower the rate at which many such materials are wasted.

As a general matter, therefore, the capabilities and incentives for American industry to use material resources more efficiently (i.e., less wastefully) will likely increase over time. Many materials that are now considered wastes will instead be used to produce new materials and products. As this happens it is likely that current distinctions between wastes and materials (which are in large part regulatory in nature) will become less meaningful. This could argue for government policies that more effectively promote, and reduce unnecessary regulatory constraints on, more efficient use of these materials.

- **Wastes will still be with us.** Wastes will not disappear by the year 2020. Though industry may well become much less wasteful in producing the goods and services that the domestic (and global) economy will demand over the next few decades, it seems logical to assume that some industrial residuals will continue to have very low potential for productive reuse or recycling, and will thus need to be managed as wastes in much the same manner as they are now. We must anticipate, therefore, a continuing need to ensure they are managed safely under

some system of controls and/or incentives that is at least analogous to today's hazardous waste regulatory framework.

Given that wastes (and the need to manage them safely) will exist in the future, we can anticipate that waste treatment and disposal technologies will evolve in important ways. Such future technologies could include the use of chemical markers, sensing and monitoring devices, and/or advanced telecommunications systems to more closely track generation, composition, movement and ultimate disposition of wastes by industry, government or perhaps even interested citizens. Waste treatment technologies should also improve, as should the performance of landfills and other disposal techniques. It may be that the concept of disposal as we now know it (i.e., permanent entombment) will also change over time if, for example, new technologies or economic forces emerge that enable recovery of materials from previously landfilled wastes.

### ***Information***

- **The information revolution will continue.** Over the next few decades we will almost certainly continue to see dramatic increases in the amounts of information available to nearly everyone on the planet, and their ability to access and share it. At this point it hardly seems possible to overestimate the effects that this will have on virtually every aspect of today's society and economy.
- **Industry, individuals and the environment will benefit.** Advances in information and communications technologies have already begun to transform the way business in general is conducted in this country, and many of these advancements should be environmentally beneficial with respect to waste and materials management. For instance, more efficient information exchange should stimulate the business of buying and trading recyclable materials between companies and industry sectors, which could create much more sophisticated markets for such materials, similar to the commodity markets of today. Similarly, more information should enhance the ability of individual consumers to make more environmentally friendly choices for products and services. As a general matter, we believe that in the year 2020 faster and more efficient information flows will result in greater awareness and knowledge of environmental issues and concerns on the part of individuals, businesses and other institutions.

### ***Globalization***

- **The global economy will be more highly integrated.** The trend toward an increasingly globalized economic system is also likely to have important effects on the future of waste and materials management. Freer movement of money and materials may result, as many now predict, in a much more integrated world economic system, as well as higher levels of prosperity and consumption in many

countries. Increased global demand for material goods and services would create the need for more capacity in manufacturing and extractive industries, which are likely to become more globally dispersed. The environmental impacts of these industrial activities worldwide would presumably also increase, though this could potentially have both positive and negative environmental consequences for the United States and other parts of the world.

- **Environmental protections will need to be more internationalized.** The worldwide environmental consequences of freer trade and international monetary policies have recently become the focus of a highly visible public debate, particularly in the United States and Europe. This debate may go on for many years. In any case, this issue may be particularly relevant to environmental concerns regarding waste and materials management, in part because such materials can be easily moved between those countries that have strict environmental protections and those that do not. Therefore, if new approaches to waste and materials management in the United States are to be successful they will likely need to be harmonized with, if not integrated into, a more global system for instituting and maintaining environmental protections.

### ***Society and Government***

- **Citizens will have more influence in environmental decisions.** Recent years have seen important changes in the relationships between citizens, industry and government regarding waste management issues, particularly at the local level. Much of this has been driven by increased awareness and environmental activism on the part of individuals and grassroots community groups—as people become more aware of chemical risks, they naturally demand further protections. By the year 2020 it is expected that continued developments in information and telecommunications technologies (as discussed above) will have created much stronger linkages than exist today between citizens and the government institutions that serve them. One result of this trend may be that citizens will be empowered to more directly and effectively influence government decisions on environmental issues that are local, regional or even global in nature.

One result of greater citizen involvement in environmental decisions would hopefully be to focus increased attention and resources on environmental problems that to date have not been adequately addressed by government or industry. One example might be a concerted effort to upgrade waste management practices on Native American lands and remote settlements in Alaska, where the environmental realities of waste disposal are still often harsh. Another could be actions to further reduce exposure to harmful chemicals in communities that bear disproportionate risks from nearby sources of pollutants.

The environmental justice movement has framed environmental protection, including patterns of impacts, as a civil rights issue. Others have framed environmental health more broadly as a human rights issue. We believe these efforts will continue and that the right to live in a relatively clean environment will continue to gain currency in this country as a basic civil right and a human right, through both laws and societal attitudes.

### **III. Goals**

As originally conceived, RCRA was designed primarily as a system of controls over management of wastes in this country, with two fundamental mandates: protection of human health and the environment from waste management and mismanagement, and resource conservation. To achieve these mandates, EPA and the States (and to a lesser extent, tribes) were provided with two primary tools: broad authority to regulate management of wastes, and broad authority to enforce its regulatory and statutory provisions. The statute, however, limited the scope of the regulatory program to certain types of wastes and certain types of regulatory mechanisms (e.g., permits, land disposal restrictions). RCRA was also designed to fit within the existing framework of media-specific environmental laws (Clean Water Act, Clean Air Act, etc.). Thus, Congress by design limited the scope of the program and its goals, and provided EPA and the States with a set of specific tools for implementing the program.

We believe that the original broad mandates of RCRA remain valid, and will be valid in the year 2020. However, we now have two decades of experience with federal, state and tribal regulation of waste management in this country, and perhaps more importantly, we can see that the “landscape” of waste management will change dramatically over the next twenty years. It therefore makes sense at this time to examine how waste and materials management should evolve in this country to meet future challenges and opportunities, while building on the elements of the current RCRA program that have been most successful. In doing so we believe it is necessary to redefine the specific goals that will guide such a future program, and examine new tools and strategies to achieve those goals.

The following discussion describes three goals that we believe could form the foundation of a new system for waste and materials management in the year 2020. For each goal we also suggest some tools and strategies that might be effective in making such a new system work. Ultimately, of course, decisions as to the specific shape and scope of a future system, and its legal underpinnings, will likely need to be made through the legislative process.

#### **Goal #1: Reduce waste and increase the efficient and sustainable use of resources.**

As discussed previously, over the next few decades it is likely that the human population of the planet will continue to rise, as will the material aspirations of large numbers of people in many parts of the world. Many believe that the resulting increased demand for resources cannot

be sustained without wide-scale degradation of the global environment, unless those resources are used with much greater efficiency than they are today. It should be understood that the concept of sustainability addresses many different issues, such as land use and species protection issues, which may only indirectly relate to waste or materials management. This goal would address the issue of sustainability only as it relates to material resources that potentially may be discarded as wastes.

Since resources are wasted in many different ways, meeting this goal would require pursuing several different objectives, and measuring success in different ways. One objective would be to reduce the overall volumes of wastes that need to be disposed of in this country, regardless of source or composition. Some would argue, in fact, that “zero waste” should be the goal. Though such a goal is almost certainly not realistic for the economy as a whole, it has the virtue of clarity and simplicity, and some companies have already adopted it as a corporate philosophy, with impressive results.

Of particular importance in working toward this goal would be to reduce generation/disposal of industrial wastes in particular; i.e., from extractive, manufacturing, service, and other industry sectors. Reducing the amounts of materials used to make certain products, or to perform certain services, would be another objective. Increasing the useful life of products would also contribute to this goal, as would increased rates of reuse/recycling of materials and products.

Meeting this goal would probably also require fundamental changes in the waste vs. non-waste regulatory construct that is embedded in the current RCRA system. The preferred result, for instance, would be that what are now considered wastes would be treated more as material commodities with potential uses, rather than as useless materials destined for disposal. One approach to making such a system work would be to identify materials as “wastes” only when they are clearly destined for disposal; until then, all potentially hazardous materials would be subject to the same set of management controls/incentives.

An integrated waste/materials management system would need to address potentially hazardous materials and products that are clearly not wastes, and which currently are subject to regulation under the Toxic Substances Control Act (TSCA). Thus, making such a system work would require integrating the functions of what are now two separate and distinct, congressionally mandated programs. A new, broader system of incentives, controls, and functions would likely need to assume a new legal and programmatic identity, rather than being grafted onto either RCRA or TSCA. Such consolidation (which might not necessarily be limited to RCRA and TSCA) could also have the advantage of greater consistency and administrative efficiency for both industry and government.

Since one of the main objectives of this type of system would be to encourage more reuse and recycling, an important concern would be to ensure that the resulting materials and products are safe, and do not contain unacceptable amounts of potentially harmful substances (i.e., “toxics along for the ride”). This has been and remains one of the most difficult challenges of the current RCRA program; making it work more effectively in a future materials management system

would likely require development of more sophisticated risk assessment techniques than are currently available, and/or establishing contaminant limits on a product-by-product, or industry-by-industry basis.

***Tools and Strategies:***

- **Economic tools may be most effective.** In a market economy, decisions involving which resources are used, what they are used for, how efficiently they are used, and ultimately how they become wasted, are primarily driven by economic forces. Thus, the most effective tools for achieving this goal are likely to be those which use economic incentives to promote more efficient resource use, and thus minimize waste generation. Specific tools could include waste generation fees or surcharges on consumption of certain resources, or credits or rebates to reward resource use efficiencies. With many of these tools, revenues could be generated and invested in specific ways to help achieve this goal, such as developing more efficient recycling technologies and/or developing markets for recycled products or materials. Achieving this goal might also include measures to reduce current economic incentives that tend to encourage the use of virgin raw materials.
- **Informational and technical innovations may also be effective.** Informational tools, such as investments in public education to enhance awareness of resource use/sustainability issues, could be an important part of meeting this goal. This could involve labeling of consumer products (e.g., some type of sustainability rating), media-based public service campaigns, internet resources, and others. In addition, more resource-efficient technologies could be stimulated by government policies; these might be developed through NASA-style direct investments in hardware, or other targeted, government-funded research and development initiatives.
- **Need for new regulatory strategies.** Many traditional environmental regulatory mechanisms (e.g., pollutant emission limits) would likely be less effective than other tools in helping to meet this goal, since such controls would only marginally affect the economics of resource use/reuse. Regulatory mechanisms that could more directly affect resource use/reuse would likely be necessary. One such approach might be a system of “extended product responsibility,” under which proper stewardship of products at the end of their life-cycles would be the responsibility of the manufacturers, retailers, local governments, and/or other appropriate entities, analogous to the producer responsibility programs already in place in several European countries. Other regulatory approaches could include prohibitions on disposal or mandated recycling of certain types of post-consumer and/or industrial wastes. In addition, quasi-regulatory approaches that might be effective could include greater reliance on corporate environmental management systems (e.g., ISO 14000), third-party certification systems, use of industry-

specific standard practices or methods, local government or community-based oversight, or other approaches.

**Goal #2: Prevent harmful exposures to humans and ecosystems from the use of hazardous chemicals.**

Exposures to potentially harmful chemicals can occur from the products and materials that we use in everyday life, as well as from exposure to wastes. If distinctions between wastes and materials become less important in the future (as suggested by Goal #1), the need to comprehensively control risks from hazardous chemicals and materials throughout their life-cycles would become a critical feature of the future program. A truly comprehensive program would thus need to appropriately address risks from chemicals as they are produced, transported and used in product manufacture, as those products are used and reused, and when the chemicals ultimately become wastes with unwanted harmful properties. Harmful chemicals (such as dioxins) that do not have commercial uses but which are nevertheless present in the environment and pose potentially serious health or ecological risks could also be addressed under such a broadened waste/materials management system. As discussed below, a regulatory program similar to the current RCRA Subtitle C system would almost certainly be unworkable for the purpose of a more comprehensive materials management system.

At the present time, managing risks from potentially harmful chemicals in the United States is accomplished through a patchwork of federal, state and local regulatory controls, voluntary industry standards, liability incentives, public education efforts, and emergency response services. In many respects this current system works reasonably well. There are, however, inherent gaps and inconsistencies as to which chemicals and which types of exposures are addressed, under what circumstances, and what types of risk mitigation measures are employed. We believe that a more coherent and consistent system for managing chemical risks could benefit human and environmental health, and could be advantageous to industry in many ways as well.

***Tools and Strategies:***

- **More information could be a powerful tool.** Informational tools (perhaps combined with other tools) might be the most effective way to reduce risks from chemicals in consumer products and other commonly used materials. More information on potential risks could influence the consumptive choices and behaviors of individuals, which could create powerful market incentives to make lower-risk products, in much the same way that nutritional labels on food packaging have greatly enhanced our ability to make informed dietary choices.
- **Potential for economic incentives and technical innovations.** Economic incentives and/or disincentives might be effective in furthering this goal, by (for example) making it more costly for manufacturers to use certain high-risk

chemicals, or encouraging development and use of less harmful materials. Liability schemes are another type of tool that could provide strong incentives for industry to manage chemicals safely, as could certain types of insurance instruments. Chemical use risks could also be mitigated by technological advances, such as through development of less harmful substitute chemicals or improved chemical handling techniques and equipment.

- **Some regulatory controls would be needed.** Some traditional environmental regulatory controls would almost certainly be necessary to ensure safe products and safe handling of hazardous chemicals by industry. Such controls might address siting of facilities, transportation and storage of hazardous materials, limits on hazardous chemical content of certain products, or outright bans on very high-risk chemicals. We believe, however, that any such system of regulatory controls would need to be less complex and more performance-based than the current hazardous waste regulatory system.

### **Goal #3: Manage wastes and clean up chemical releases in a safe, environmentally sound manner**

A fully realized transition from a RCRA-style waste management program to a broader materials management system has the potential for substantially reducing the volumes of wastes that are generated by the nation's businesses and households. However, as discussed previously, it is almost certain that two to three decades from now wastes will still be with us. Ideally, of course, all wastes would be used and reused in a continuous cycle, in much the same way as natural ecological systems work. Unfortunately, American industry is not as efficient as nature at materials recycling, and is unlikely to become so within the next few decades. Although the types, volumes, and composition of wastes will change over the next few decades, we must assume a continued need for waste disposal capacity, as well as some type of management system that ensures adequate protections for human and ecological health.

In fashioning an effective waste management program as part of a broader materials management system, one of the important issues that would need to be addressed is how and at what point in a material's life cycle it would be considered a waste. As discussed above, one approach could be to classify a material as a waste at the point where it is clearly destined for disposal, such as when it is shipped to a facility to be landfilled. Since under an integrated materials management system all materials would be subject to essentially the same controls/incentives, the concept of waste management would be reduced (from the current RCRA program) to controls over transportation, landfill design, operation and monitoring, and any required treatment of wastes prior to disposal in landfills.

Under this type of system the current "cradle-to-grave" approach to waste management would be supplanted by a system in which materials that are now considered wastes would instead be presumed to be valuable materials, unless and until their useful life is expended

(however that may be determined). This type of system could therefore be thought of as a “retirement to grave” waste management system. The main features of a future waste management system, particularly for high-risk industrial wastes, would likely evolve from the more successful elements of the current RCRA program.

A major emphasis of the current RCRA program involves protection of ground water and other environmental media from contamination, by both prevention measures (e.g., unit design standards and monitoring requirements) and cleanup of past releases. Preventing future releases would obviously remain a key objective of a future waste management program. By the year 2020 cleanup of existing contamination problems at RCRA-regulated facilities will hopefully be largely complete, though some long-term remediation work may still be ongoing, and some mechanism for addressing future releases will presumably be needed. This cleanup function of the current RCRA program could be retained in a future waste management system, or could become the responsibility of one or more other federal or state cleanup programs.

### ***Tools and Strategies:***

- **Some regulatory controls would likely be necessary.** Under a more comprehensive waste and materials management system, the materials that would be considered wastes would primarily be those that are lowest in value and least amenable to reuse/recycling. Because these “wastes” would have negative value to those who generate them, there would be a clear incentive to dispose of them as inexpensively as possible. This at least implies the need for a system of government-administered controls, particularly for those wastes with the highest relative risk potential. As stated previously, a future regulatory system should be able to effectively protect public health and prevent mismanagement of waste materials, while being less complex and more performance-based than the current RCRA Subtitle C system.
- **Other tools could lessen the need for regulation.** Economic incentives such as surcharges on waste generation or disposal might be used to further encourage waste minimization. Revenues from these incentives could be used to develop waste treatment and recycling technologies. Other fiscal policies, such as tax credits for companies that reduce waste generation, or a requirement that companies maintain certain types of insurance, could also be effective incentives.

Information tools could also work. For example, public disclosure (e.g., on the internet) of facilities’ waste generation and management practices could create pressure on companies to manage wastes safely. Advanced information and communications tools could also enhance government and third-party oversight capabilities over waste management activities.

It is also entirely possible that future technologies could make waste treatment much more effective and/or less expensive than today. In the next twenty years

we will also presumably have much more information on the long-term performance of landfill containment systems, which could lead to significant improvements in waste disposal techniques.

#### **IV. Conclusions**

The only certainty about waste and materials management in the year 2020 is that things will have changed considerably from today, no doubt in many ways that are impossible to anticipate at this time. We believe that the current system for waste management in the United States, and perhaps other environmental regulatory programs that were developed in the 1970s, will also need to change in important ways if we are to meet the environmental challenges of the coming decades.

We acknowledge the likelihood that some of the trends and directions articulated in this paper will ultimately be proved wrong, and that the future of waste and materials management two decades from now will be influenced by many forces which we have not anticipated. This does not argue for inaction, however. In fact, we believe that the fundamental goals of a future waste and materials management system, as described in the preceding section of this paper, will likely remain valid twenty years from now, despite these uncertainties.

We believe that sustainability is a critical environmental, economic and quality of life issue that this country and others will need to confront over the next decades. Since the United States is by far the world's largest consumer of goods and services, we have the responsibility to act with serious purpose to use resources more efficiently and work toward a more sustainable national and global economy. We believe that developing new approaches for conserving resources, reducing toxic materials and managing wastes properly can and should be an important part of responding to this challenge of making a more sustainable world. Promoting resource conservation along with economic growth will need the full range of innovative tools we can collectively devise.

Potentially harmful chemicals can enter the environment throughout the materials life cycle: from material extraction or creation; product manufacturing; commercial or personal use; and ultimately, as they are disposed of as wastes (at this point in time, waste disposal probably represents only a small part of the source of exposure to harmful chemicals). If we want to reduce the volume of materials used in creating a sustainable lifestyle and reduce the amount of toxic chemicals in the environment, we believe that we need as a society to focus on materials management as well as proper waste disposal. How to create the proper set of economic incentives, share accurate information to inform choices, control and restrict improper practices, and measure the environmental benefits of such a system will be the major challenges facing those who may be interested in pursuing the goals outlined in this paper.

Many of the ideas presented in this paper suggest the need to create a more comprehensive system for waste and materials management, in ways that go well beyond the

scope of the current RCRA program. For example, controlling risks of chemicals throughout their life cycles (i.e., before and after they become wastes) under a single, unified system would obviously be a major departure from how the RCRA and TSCA programs currently operate. It might also require integrating other programs and authorities, including some that are not currently administered by EPA. We recognize that creating such a comprehensive or “holistic” system for wastes and materials would be a complex undertaking. We are certain, though, that these are ideas well worth exploring. It may be that this could eventually become part of an even larger effort to create a single, unified program for all environmental media that the federal government, the states and tribes now implement under various statutes.

While seeds for this broader effort may be nested within the ideas contained in this paper, we encourage the reader to join the dialogue surrounding the primary task the authors of this paper have set for themselves: how can appropriate policies regarding resource conservation, materials management, and the proper disposal of wastes (which will hopefully be smaller in volume and less potentially harmful) emerge to meet the challenges of the next quarter century?